DOCUMENT RESUME

ED 135 635 SE 022 014

TITLE	An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1977.
INSTITUTION	National Science Foundation, Washington, D.C. Div. of Science Resources Studies.
REPORT NO	NSF-76-325
PUB DATE	Sep 76
NOTE	165p.; Contains occasional small print and colored pages
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock Number 038-000-00298-8, $2.45)
EDRS PRICE	MF-$0.83 HC-$8.69 Plus Postage.
DESCRIPTORS	*Federal Aid; *Federal Programs; Financial Support; *Research; Science Education; Scientific Research; *Statistical Data

ABSTRACT

This report provides an account of federal funding of research and development (R&D) programs in 15 areas for the years 1969-77. Part 1 lists federal R&D expenditures according to function and includes comments and comparisons pertaining to the functions. Part 2 provides more detailed analyses of R&D expenditures for each function individually, including graphs that chart the overall and subfunction expenditures of each function from 1969-77, and explanatory comments. The appendices include an additional statistical table that lists R&D obligations by function, subfunction, and agency program for each year during the period 1969-77. (MH)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED135635

SE 022 014

An Analysis of Federal R&D Funding by Function

Surveys of Science Resources Series • National Science Foundation • NSF 76-325

Related Publications

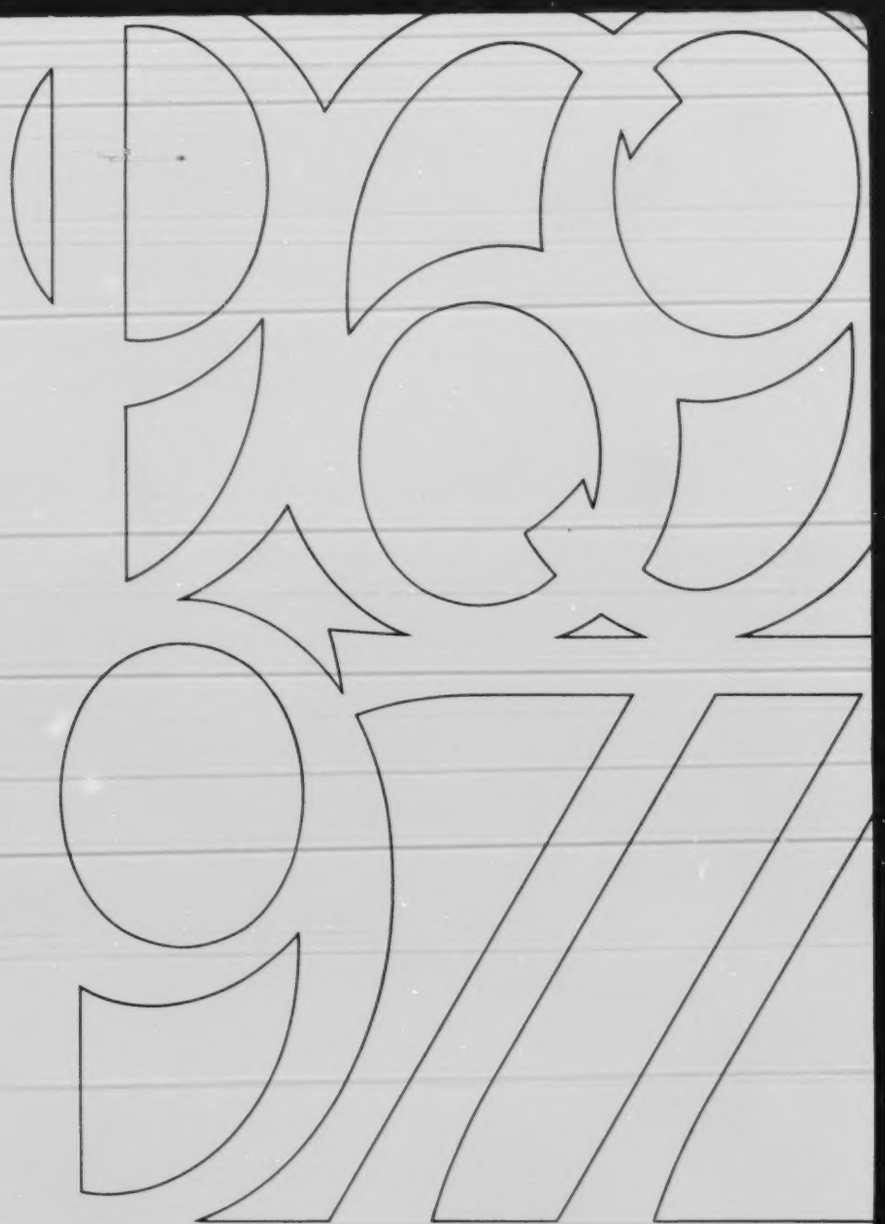
REPORTS	NSF No.	Price
Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1975, 1976, and 1977, Vol. XXV	76-000	In press
Detailed Statistical Tables, Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1975, 1976, and 1977, Vol. XXV	76-315	——
National Patterns of R&D Resources: Funds and Manpower in the United States, 1953-1976	76-310	$0.95
An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1976	75-330	$1.80
HIGHLIGHTS		
"Real Increases Seen for Federal R&D Funding of Energy, Education, Science, and Defense in FY 1977"	76-319	——

Availability of Publications

Those publications marked with a price should be obtained directly from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Where no price is listed, single copies may be obtained gratis from the National Science Foundation, Washington, D.C. 20550.

(See inside back cover for Other Science Resources Publications)

Fiscal Years



An Analysis of Federal R&D Funding by Function

FOREWORD

This report represents a continuing effort of the National Science Foundation to classify and analyze Federal R&D program data under broad functional headings. The first attempt was made in 1971. The purpose has been to provide a perspective on Federal response to a range of national needs in terms of R&D support and to show changing R&D priorities. Since federally generated support now represents 53 percent of all R&D support nationwide, the impacts are far-reaching.

The current analysis provides a 9-year view of program growth and change. The system requires that each program be assigned to only one function, or subfunction, on the basis of the program's primary purpose, with no overlapping from one function to another so that comparability can be achieved over a timespan. The function list, however, may change from one year to the next, and program focuses may also change, necessitating the transfer of a program from one function to another. Therefore, each report is a revised edition and not a continuation of previous reports.

This study was prepared in the Division of Science Resources Studies under the general guidance of Charles E. Falk, Director, and William L. Stewart, Head, R&D Economic Studies Section.

Richard C. Atkinson
Acting Director
National Science Foundation

September 1976

methodology

The 15 functions and 34 subfunctions in this report were chosen to make visible the most important R&D objectives in the 1977 budget. Data are additive to 100 percent, and thus each program can only appear under the function that embraces its primary purpose and not under headings that relate to secondary purposes.

acknowledgments

This report was prepared under the direction of Benjamin L. Olsen, Study Director, Government Studies Group. Jane Pugh was responsible for aggregating the data and preparing the appendix table. Eleanor Stoddard was responsible for organizing the report and the graphics and for writing the text with the assistance of Barbara Leach. Dorothy K. Ham prepared statistical material and graphic illustrations.

note

- Table and chart details may not add to totals because of rounding.
- R&D support levels shown in this report include both program costs and administrative costs.

CONTENTS

Highlights vii

Introduction viii

Part I. Federal R&D Priorities by Function 1

Part II. Functions in Detail* 11

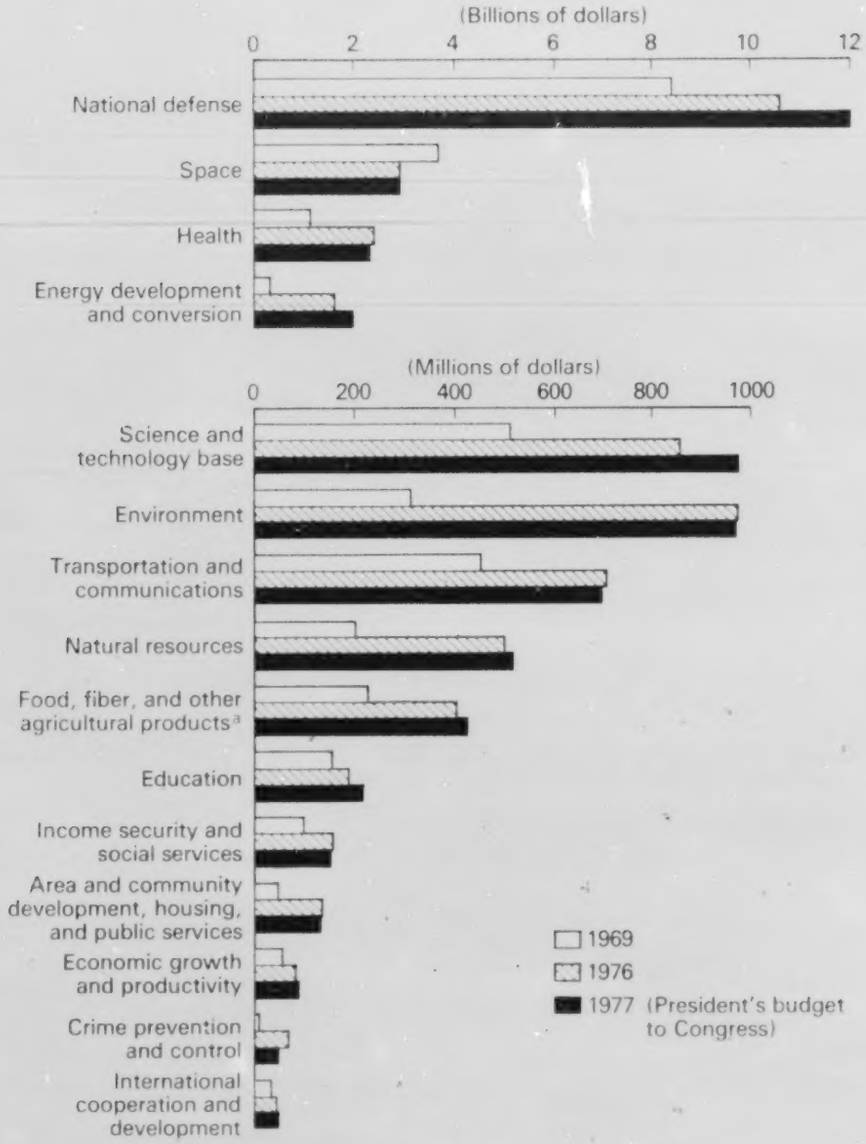
- National Defense 12
- Space 15
- Health 18
- Energy Development and Conversion 22
- Science and Technology Base 26
- Environment 29
- Transportation and Communications 34
- Natural Resources 39
- Food, Fiber, and Other Agricultural Products 45
- Education 48
- Income Security and Social Services 50
- Area and Community Development, Housing, and Public Services 53
- Economic Growth and Productivity 55
- Crime Prevention and Control 57
- International Cooperation and Development 60

Appendixes

- A. Technical Notes 63
- B. Detailed Statistical Table 66

* Sections are presented in descending order of Federal R&D obligations in the 1977 budget.

FEDERAL R&D OBLIGATIONS BY FUNCTION, FY 1969, 1976 (est.) and 1977 (est.)



[a]Most programs under this function category were formerly shown within natural resources under a food subfunction.

SOURCE: National Science Foundation

HIGHLIGHTS

- Between fiscal year 1969 and fiscal year 1977 Federal R&D obligations have risen from $15.6 billion to $23.5 billion. The average annual growth rate for this period is 5.2 percent, but when totals are converted to current dollars an average annual rate of decline of 1.0 percent is revealed.[1]

- In fiscal years 1975, 1976, and 1977, however, relative annual increases have been higher than at any other time in the 9-year period under analysis. The current-dollar increases for these years are 9.2 percent, 13.5 percent, and 8.6 percent, respectively, with the increases for the latter 2 years well ahead of known or anticipated inflation.

- A few functional areas have been the chief sources of the growth. In 1975, 1976, and again in 1977 high relative increases have been shown for two major functions:[2] energy development and conversion, and science and technology base. Major functions with high relative growth in 2 of the 3 years are national defense, environment, and natural resources.

- In 1977 national defense is scheduled for a rise of $1,346 million; energy development and conversion for an increase of $390 million; science and technology base for a gain of $120 million; and space for growth of $62 million.

- In 1977 functions with highest relative increases are the energy function, up 24 percent; education, up 15 percent; science and technology base, up 14 percent; and national defense, up 13 percent.

[1] In the absence of a reliable R&D cost index the GNP implicit price deflator was used for 1969-76 with an estimate for inflation in 1977.

[2] Major functions are defined as those with current annual funding levels of $500 million or more.

- In 1977 two areas show moderate relative growth: international cooperation and development—up 8 percent; and food, fiber, and other agricultural products—up 7 percent.[3]

- In 1977 three functions that show nominal relative growth are space, natural resources, and economic growth and productivity—none of these gaining more than 4 percent.

- The largest dollar decrease is scheduled for health—down $100 million, or 4 percent. Next largest dollar decrease is shown by crime prevention and control—down $19 million, or 31 percent below 1976.

- Functions with small dollar reductions are transportation and communications; income security and social services; area and community development, housing, and public services; and environment. None of these reductions is as much as 2 percent below the 1976 total.

- Over the longer term, 1969-77, three functions have remained in the lead in funding, and always in the same order. These are national defense, space, and health. Of these, health is the only function with a relatively high average annual growth rate—9.1 percent. For national defense the comparable rate is 4.6 percent, below the overall Federal average. For space, a decline at an annual average rate of 2.9 percent is registered. The space function is the only one with lower funding in 1977 than in 1969.

- Between 1969 and 1977 other major functions with high average annual growth rates are energy development and conversion, with 26.0 percent; environment, with 15.1 percent; natural resources, with 12.7 percent; and science and technology base, with 8.4 percent.

- Smaller functional areas with high growth rates in the same period are crime prevention and control, with 32.0 percent; area and community development, housing, and public services, with 13.5 percent; and food, fiber, and other agricultural products, with 8.4 percent.

[3] Food, fiber, and other agricultural products is a new function category in this report. Most programs under this activity were shown in earlier reports within natural resources under a food subfunction.

INTRODUCTION

The present report is the sixth in a series that has evolved to answer the need for analysis of Federal R&D activities by function or objective. The function analyses were developed from R&D data obtained from the National Science Foundation annual surveys on Federal R&D funding that cover agencies, character of work, performers, and fields of science.[1] Despite the usefulness of these categories for science resource analysis, additional aggregations were increasingly required of Federal R&D program data that would reveal the relative support given to broad areas by cutting across agency lines and grouping programs by major purposes.

Therefore, in 1971 the first of the functional series was published, relating R&D programs to the functions shown in the Federal budget. Since that time the annual functional analyses have broken away from the budget function system in order to reflect R&D objectives more precisely, and agencies have been requested to report dollar levels for individual programs in the *Federal Funds* survey along with the traditional categories. The present report, *An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1977,* is the fourth to cover the data over a timespan beginning with fiscal year 1969 and ending with the most recent year, but it differs in one important respect from the three previous reports, and that is in the addition of a new functional category—food, fiber, and other agricultural products.

---

[1]The *Federal Funds for Research, Development, and Other Scientific Activities* series dates from fiscal year 1952 and covers all Federal agencies with R&D programs.

Function categories are chosen to reflect public interest in given areas, as indicated by public debate and current legislation. The food and fiber function, of which most of the programs had formerly appeared under a food subfunction within natural resources, was selected as a major category since growing interest is now being shown in this area.

The data in this report are based on amounts requested in the President's 1977 budget message to Congress at the midpoint of fiscal year 1976; therefore the tentative nature of 1976 and 1977 program levels should be stressed. The data were collected by NSF in the *Federal Funds* survey in March and April of 1976, and thus for fiscal year 1977 they do not reflect congressional appropriations or changes made by Executive apportionment. For fiscal year 1976 they reflect estimates rather than final obligation actions. Also, anyone with a close knowledge of programs may find that program amounts shown in the detailed statistical table (appendix B) differ somewhat from totals shown in agency budgets. Such differences arise from the addition of administration costs to program costs by NSF staff.

Of necessity, programs have been identified by the agencies in the *Federal Funds* survey at various levels of aggregation. Some programs are combinations of a number of smaller programs with varying purposes, and these subprograms would be assigned by NSF staff to various functions if funding levels for them were obtainable. As it is, the primary purpose of the broader program must be used in these cases to determine assignment to a function. Even though this report would benefit from greater program detail, a fairly high degree of definition is obtainable with the detail now available.

Each year organizational changes take place within the Executive branch through the formation of new agencies, termination of others, and interagency program transfers. The latest agency structure was used in this report, and prior-year data were spread to conform to this structure as though Federal agencies had been organized that way since 1969. When program structures change as well, prior-year programs are sometimes split and recombined to conform to the new program coverage.

The functional data are additive to 100 percent with no overlapping of programs between functions. In most cases the primary purpose of an R&D program was evident from descriptions provided by the agency, but in some cases two almost equally important purposes might be discernible. NSF staff, rather than the agencies, decided on the assignment of all programs to functions or subfunctions, and with all Federal R&D programs available for simultaneous study and comparison, the staff could resolve fine points of difference.

The functional categories in this report have been chosen on the basis of size of effort, current and continuing public interest in a given area, and the need for a clearcut definitional framework encompassing all Federal R&D programs. The selected categories, of course, may fail to point up certain areas considered important by analysts with particular interests. The point should therefore be made that it is possible to regroup the 395 programs shown in the appendix B table under different function headings than are used in this report.

Aside from groupings under new function headings, larger groupings of programs under the present headings can also be made in order to attain a broader scope as long as the "100 percent additive" requirement is ignored. With secondary purposes permitted as a basis for inclusion, energy and energy-*related* programs, for example, can be shown under energy, and health and health-*related* programs can be shown under health. Such a system, however, nullifies any real analysis of relative priorities, which can only be revealed under a system based on the assignment of programs to functions on the basis of primary purpose alone.

FEDERAL AGENCY/PROGRAM ABBREVIATIONS

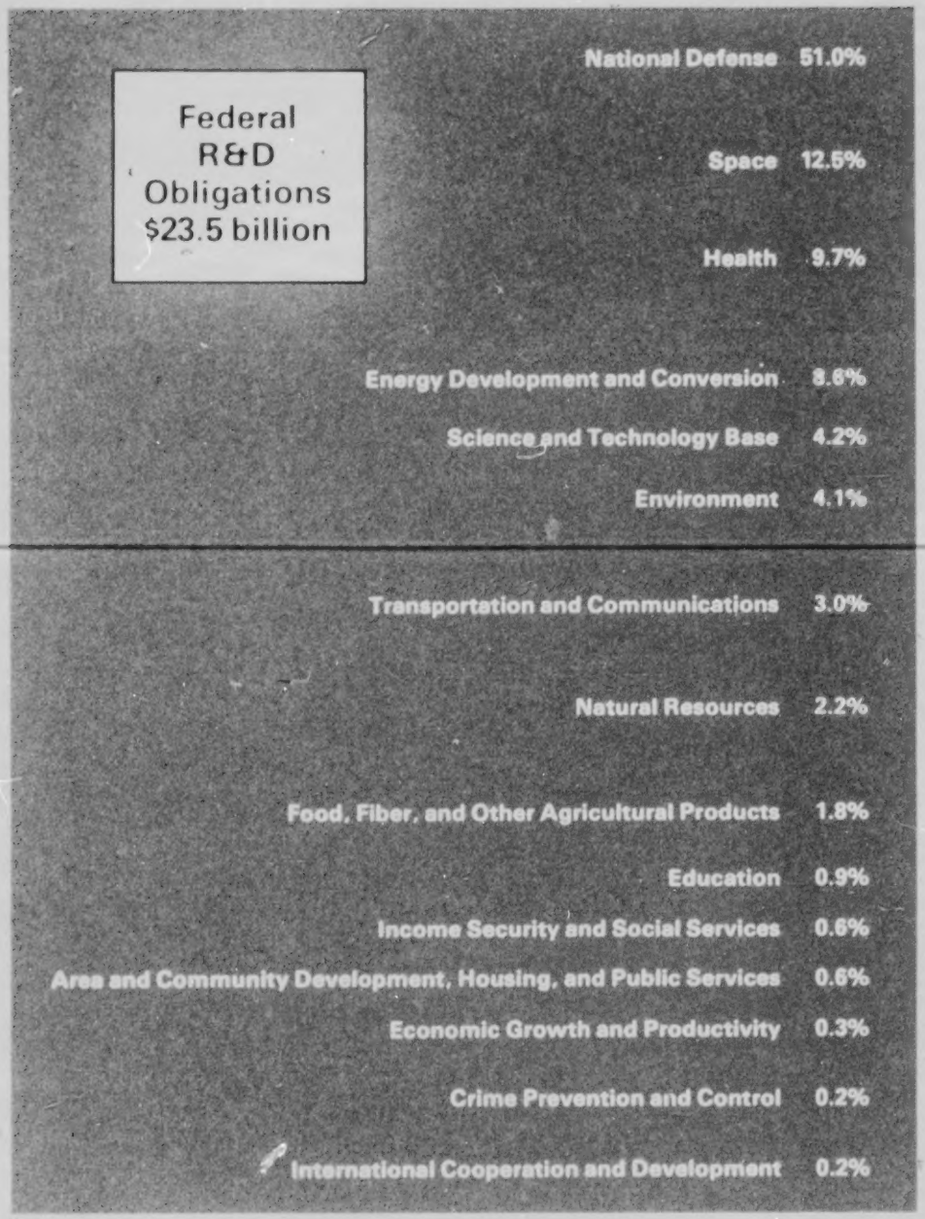
ADAMHA	—	Alcohol, Drug Abuse, and Mental Health Administration
ARS	—	Agricultural Research Service
BLM	—	Bureau of Land Management
BLS	—	Bureau of Labor Statistics
CDC	—	Center for Disease Control
CG	—	Coast Guard
CSA	—	Community Services Administration
CSRS	—	Cooperative State Research Service
DEA	—	Drug Enforcement Administration
DOD	—	Defense, Department of
DOT	—	Transportation, Department of
EPA	—	Environmental Protection Agency
ERDA	—	Energy Research and Development Administration
ERS	—	Economic Research Service
FAA	—	Federal Aviation Administration
FBI	—	Federal Bureau of Investigation
FDA	—	Food and Drug Administration
FHA	—	Federal Highway Administration
FRA	—	Federal Railroad Administration
FS	—	Forest Service
FWS	—	Fish and Wildlife Service
GARP	—	Global Atmospheric Research Program
GS	—	Geological Survey
HEW	—	Health, Education, and Welfare, Department of
HRA	—	Health Resources Administration
HSA	—	Health Services Administration
HUD	—	Housing and Urban Development, Department of
IDOE	—	International Decade of Ocean Exploration
LEAA	—	Law Enforcement Assistance Administration
NASA	—	National Aeronautics and Space Administration
NBS	—	National Bureau of Standards
NHTSA	—	National Highway Traffic Safety Administration
NIE	—	National Institute of Education
NIH	—	National Institutes of Health
NOAA	—	National Oceanic and Atmospheric Administration
NRC	—	Nuclear Regulatory Commission
NSF	—	National Science Foundation
OCR	—	Office of Coal Research
OE	—	Office of Education
OEP	—	Office of Emergency Preparedness
OHD	—	Office of Human Development
OMBE	—	Office of Minority Business Enterprise
OS	—	Office of the Secretary (DOT) (HEW) (Interior) (Labor)
OWRT	—	Office of Water Research and Technology
RANN	—	Research Applied to National Needs
SRS	—	Social and Rehabilitation Service
SSA	—	Social Security Administration
TVA	—	Tennessee Valley Authority
UMTA	—	Urban Mass Transportation Administration
USDA	—	Agriculture, Department of
VA	—	Veterans Administration

x

Part I

FEDERAL R&D PRIORITIES BY FUNCTION

SHARE OF FUNCTIONS IN FEDERAL R&D TOTAL WITH SUBFUNCTIONS: FY 1977 (est.)


Federal R&D Obligations $23.5 billion
National Defense 51.0%
Space 12.5%
Health 9.7%
Energy Development and Conversion 8.6%
Science and Technology Base 4.2%
Environment 4.1%
Transportation and Communications 3.0%
Natural Resources 2.2%
Food, Fiber, and Other Agricultural Products 1.8%
Education 0.9%
Income Security and Social Services 0.6%
Area and Community Development, Housing, and Public Services 0.6%
Economic Growth and Productivity 0.3%
Crime Prevention and Control 0.2%
International Cooperation and Development 0.2%

- National Defense
  - Defense military
  - Defense-related atomic energy
  - Other defense-related
- Space
  - Manned space flight
  - Space sciences
  - Space technology
  - Supporting space activities
- Health
  - Biomedical research
  - Mental health
  - Delivery of health care
  - Drug abuse prevention and rehabilitation
- Energy Development and Conversion
  - Nuclear
  - Fossil
  - Solar, geothermal, and advanced energy systems
  - Conservation
  - Other
- Science and Technology Base
- Environment
  - Environmental health and safety
  - Understanding, describing, and predicting the environment
  - Pollution control and environmental protection
- Transportation and Communications
  - Air
  - Ground
  - Water
  - Multimodal
  - Communications
- Natural Resources
  - Mineral
  - Water
  - Land
  - Recreation
  - Multiresource
- Food, Fiber, and Other Agricultural Products
  - Production
  - Marketing and distribution
  - Other
- Education
- Income Security and Social Services
- Area and Community Development, Housing, and Public Services
- Economic Growth and Productivity
- Crime Prevention and Control
  - Prevention and control of drug trafficking
  - Other crime prevention and control
- International Cooperation and Development

SOURCE: National Science Foundation

TRENDS AND RELATIONSHIPS

- From fiscal year 1969 to fiscal year 1977 total Federal R&D obligations reflect an increase from $15.6 billion to an estimated $23.5 billion, or an average annual growth rate of 5.2 percent. The significant feature of this growth, however, is that almost all of it has taken place in recent years. Between 1969 and 1974 the rate of growth was 2.2 percent compared with a rate of 10.4 percent from 1974 to 1977.

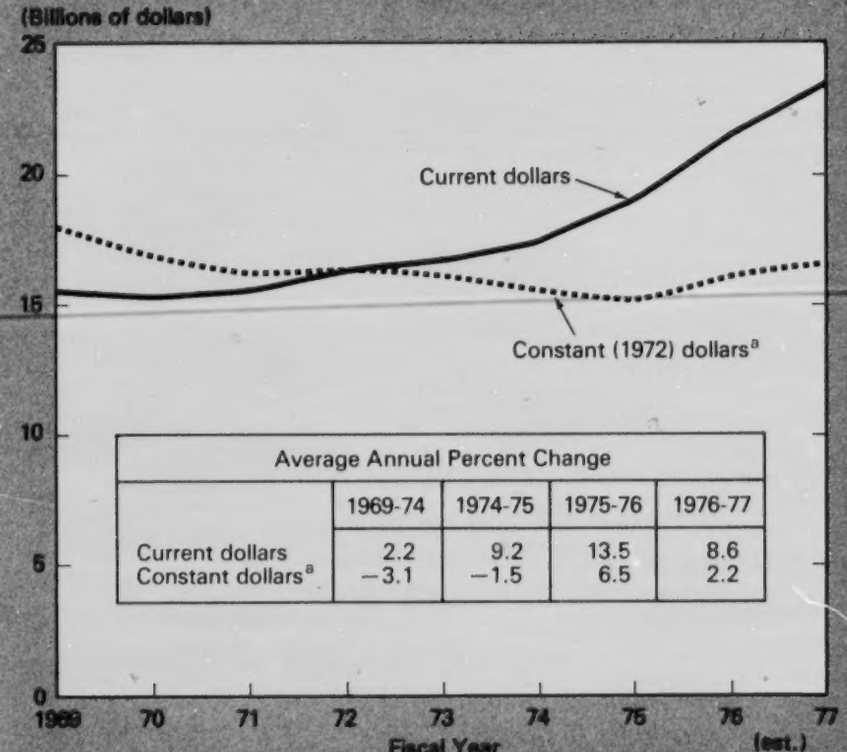
- The year 1975 represents the beginning of an apparent upward trend with a rise of 9.2 percent, followed in 1976 with an expected gain of 13.5 percent and in 1977 with an estimated increase of 8.6 percent. In constant dollars the increase for 1975 is translated into a slight decrease because of the high rate of inflation that year, but the growth in 1976 is high even in constant dollars, and the gain for 1977 is greater than the anticipated inflationary rate.[1]

- The areas that have accounted for most of the recent growth can be singled out. In 1975 very high relative increases were shown by energy development and conversion and also by natural resources and environment. Fairly high relative growth was shown by science and technology base.[2] Between 1969 and 1974 comparable growth rates for these functions were significantly lower, except in the case of environment. The largest *dollar* growth in 1975, however, was recorded by national defense, even though the relative growth was moderate. Energy contributed the next largest dollar gain.

[1] In the absence of a reliable R&D cost index the GNP implicit price deflator was used for the years 1969-76 with an estimate for inflation in 1977.

[2] This function covers support to basic research in the various fields of science, as well as some applied research, where the chief purpose is to support research as a source of national scientific strength rather than to support agency mission objectives. Some research that provides the basis for development of future systems and technologies is also included.

FEDERAL R&D OBLIGATIONS: FY 1969-77



	Average Annual Percent Change			
	1969-74	1974-75	1975-76	1976-77
Current dollars	2.2	9.2	13.5	8.6
Constant dollars[a]	−3.1	−1.5	6.5	2.2

[a]Based on GNP implicit price deflator with an estimate for FY 1977.
SOURCE: National Science Foundation

- In 1976, the year of greatest relative increase for the Federal R&D total, high relative growth was shown by the greatest number of major functions:[3] energy, environment, natural resources, space, national defense, and science and technology base, in descending order of relative increase. Again, however, the functions contributing most in *dollars* to the overall Federal R&D gain were national defense and energy, followed by a significant contribution from space.
- In 1977 overall growth is based on strong gains in a few major areas. Energy development and conversion is scheduled for a rise of 24 percent; science and technology base for growth of 14 percent; and national defense, for a 13-percent gain.

[3] Major functions are defined as those with current annual funding levels of $500 million or more.

Federal R&D obligations by function:[1]
Average annual percent change in selected periods

Function	1969-74	1974-75	1975-76	1976-77
Total	2.2	9.2	13.5	8.6
National defense	1.4	7.2	10.6	12.6
Space	-7.8	1.4	14.6	2.1
Health	13.2	3.8	8.7	-4.2
Energy development and conversion	13.0	83.4	47.0	23.9
Science and technology base	6.2	12.5	9.7	14.0
Environment	17.0	20.8	16.4	-.1
Transportation and communications	8.9	-8.9	11.1	-1.2
Natural resources	11.1	28.8	14.9	3.4
Food, fiber, and other agricultural products	5.3	19.8	15.4	6.6
Education	2.3	-7.1	16.8	15.3
Income security and social services	7.2	10.2	2.4	-1.6
Area and community development, housing, and public services	19.4	5.6	8.0	-.4
Economic growth and productivity	3.9	-6.2	24.2	3.7
Crime prevention and control	49.0	26.6	37.8	-30.5
International cooperation and development	-.1	11.3	15.5	7.7

[1] Listed in descending order of 1977 obligations.

SOURCE: National Science Foundation.

- The dollar gains of these functions are $1,346 million for national defense; $390 million for energy development and conversion; and $120 million for science and technology base. Space is scheduled for the fourth largest dollar growth—$62 million—but this gain is only 2 percent for this function.
- Three smaller areas that show real relative growth in 1977 are education—up 15 percent; international cooperation and development—up 8 percent; and food, fiber, and other agricultural products—up 7 percent.
- The eight remaining functional areas in 1977 are expected either to decline in terms of real growth or to show an absolute decline in support.
- Over the longer term, 1969-77, strongest growth trends for major functions have been shown by energy—with an average annual growth rate of 26.0 percent; environment—with 15.1 percent; natural resources—with 12.7 percent;[4] health—with 9.1 percent; and science and technology base—with 8.4 percent.
- In the same period the most rapid growth for smaller functions has been found in the areas of crime prevention and control—32.0 percent; area and community development, housing, and public services—13.5 percent; and food, fiber, and other agricultural products—8.4 percent.
- Three functions have remained in the leading positions, and in the same order, throughout the entire 9-year period. These are national defense, space, and health. The growth rate for national defense, however, has been only 4.6 percent while space shows an actual decline of 2.9 percent, the only function with lower funding in 1977 than in 1969.
- A broad downward shift in the share of national defense and space, taken together, within the Federal R&D total, has occurred since 1969. In 1969 the joint share of these functions was 77 percent, but by 1974 it was only 66 percent, reflecting a decline in funding for space, low growth for national defense, and a significant rise in funding for nondefense R&D programs other than space. In 1977, even though support to national defense and space is higher, the defense/space share is expected to be only 64 percent.

[4] Natural resources in earlier reports included under a food subfunction most of the R&D programs assigned in this report to the new function of food, fiber, and other agricultural products.

- **National defense** support, which throughout the 1969-77 period has made up approximately one-half of the Federal R&D total, is expected to account for 51.0 percent in 1977 compared with 53.4 percent in 1969. The lower share reflects the fact that the 1.4-percent average annual growth rate for this function between 1969 and 1974 was the lowest for any function except for two functions that showed declines. Since 1974 substantial yearly increases have produced an average annual growth rate for the 1974-77 period of 10.1 percent.

  In 1977 a substantial share of the requested $1,346 increase for national defense is allotted to *missiles and related equipment*, which has been the leading program area every year in the time series except 1972. Between 1969 and 1974 the trend in funding was downward, influencing the entire national defense function. Since then the trend for missiles has been upward.

  Programs with greatest emphasis on growth in 1977 are the Navy sea-launched cruise missile and fleet ballistic missile system, the Army U.S. Roland short-range air defense system, and Pershing II nuclear strike missile, and the Air Force ICBM technology and air-launched cruise missile.

  Other equipment, always one of the leading program areas, will account for an estimated one-fifth of the national defense R&D growth in 1977. Since 1969 this area has shown a strong growth trend and an increasing share of the national defense total. It currently includes such expanding programs as the Air Force E-4, advanced airborne command post.

  About one-fourth of the increase for national defense is devoted to *aircraft and related equipment*. This program area has always been a major one and currently makes up almost one-fifth of the total function. The major programs to influence the 1977 rise are the Navy F-18 fighter aircraft and LAMPS helicopter, the Army AAH advanced attack helicopter, and the Air Force F-16 air combat fighter and EF-111A electronic warfare subsystems.

Federal R&D obligations by function:[1] fiscal years 1969-77

[Dollars in millions]

Function	1969	1970	1971	1972	1973	1974	1975	1976 est.	1977 est.
Total	$15,641.1	$15,340.3	$15,564.2	$16,511.9	$16,821.2	$17,438.2	$19,044.3	$21,624.7	$23,487.6
National defense	8,353.7	7,976.3	8,106.1	8,897.7	8,997.9	8,974.6	9,620.9	10,641.4	11,987.1
Space	3,731.7	3,509.9	2,893.0	2,714.3	2,601.3	2,477.6	2,511.3	2,878.5	2,940.3
Health	1,126.8	1,125.8	1,340.1	1,589.9	1,626.0	2,097.9	2,178.3	2,368.3	2,268.6
Energy development and conversion[2]	327.9	317.3	323.6	352.7	441.6	605.1	1,109.7	1,631.5	2,021.1
Science and technology base	513.4	524.6	523.7	601.2	604.4	694.3	781.3	857.0	976.6
Environment	315.2	354.1	464.7	533.3	651.8	693.3	837.4	974.6	974.0
Transportation and communications	458.1	590.2	778.7	614.6	630.1	702.9	640.5	711.3	702.5
Natural resources	201.0	237.5	325.0	354.0	341.0	340.8	438.8	504.4	521.4
Food, fiber, and other agricultural products[3]	225.0	240.6	246.9	290.7	296.9	291.0	348.5	402.2	428.6
Education	154.8	146.6	186.1	190.7	214.2	173.5	161.2	188.2	217.0
Income security and social services	96.7	106.4	132.1	129.2	162.3	136.7	150.7	154.2	151.7
Area and community development, housing, and public services	49.4	91.1	107.9	101.5	117.9	119.9	126.6	136.8	136.3
Economic growth and productivity	55.8	79.2	92.5	57.7	68.2	67.5	63.3	78.7	81.5
Crime prevention and control	4.8	8.6	10.3	25.0	34.8	36.3	45.9	63.2	43.9
International cooperation and development	26.8	32.2	32.3	29.5	32.9	26.7	29.8	34.4	37.0

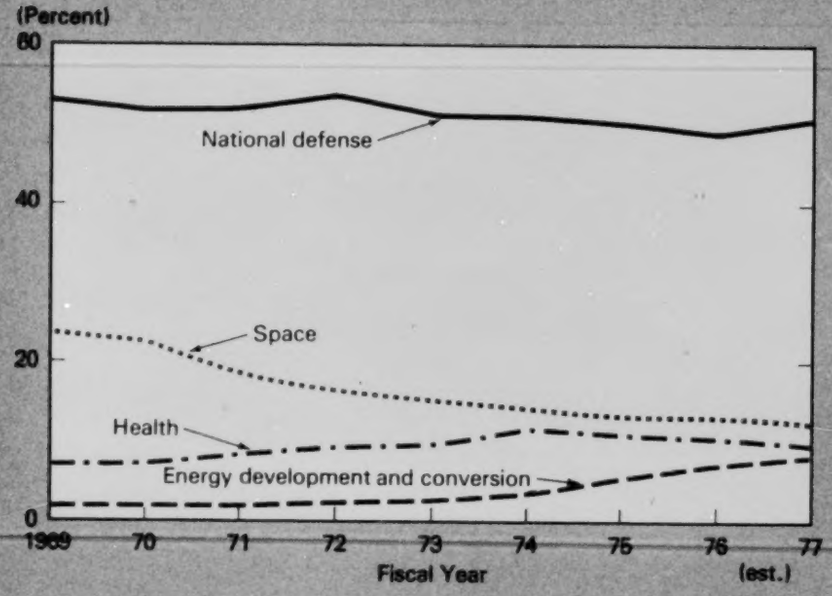
[1] R&D plant excluded.

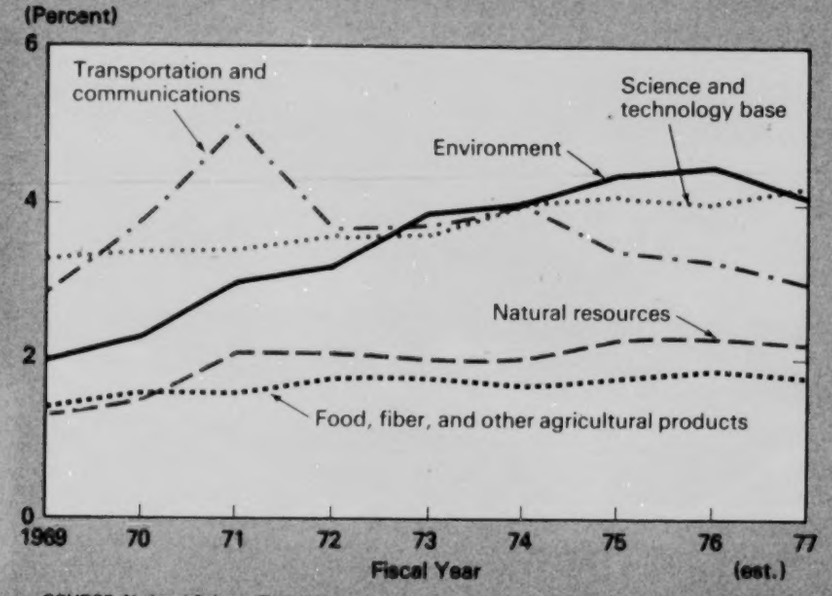
[2] The inclusion of R&D plant obligations for energy would add $276 million in 1975, $302 million in 1976, and $487 million in 1977.

[3] Most programs under this function category were formerly shown within natural resources under a food subfunction.

SOURCE: National Science Foundation.

TRENDS IN DISTRIBUTION OF FEDERAL R&D OBLIGATIONS FOR SELECTED FUNCTIONS





SOURCE: National Science Foundation

6

Programwide management and support has grown as a share of total national defense R&D activities in recent years and is now the fourth-largest program area.

Other program areas with important increases in 1977 are *ordnance, combat vehicles, and related equipment* and *ships, small craft, and related equipment.*

Military astronautics declined markedly in support between 1969 and 1974, contributing to low overall growth for the national defense function. The level for this program area has changed little since that year. *Military sciences,* which also reflects lower support in 1977 than 1969, is scheduled for an important increase over 1976.

Defense-related atomic energy programs are scheduled for only slight overall growth in 1977. The proposed funding level for that year is not much higher than the 1969 level.

- **Space** has accounted for an almost steadily declining share of the Federal R&D total, moving from 23.9 percent in 1969 to an estimated 12.5 percent in 1977.

Between 1969 and 1974 funding levels fell each year, producing an average annual rate of decline of 7.8 percent. Since then, however, each year has shown an increase. The earlier period covered the phaseout of the Apollo program from its 1969 peak to its 1973 termination. In 1974 the space shuttle began to move into full development.

Manned space flight is dominated by the space shuttle program at the present time, and in 1977 this subfunction is expected to account for almost two-thirds of all space activities. Always the largest area, it has declined substantially since 1969 when the Apollo program was at its height.

Space sciences, making up almost one-fifth of the space total in 1977, will show a reduction in funding, resulting from a curtailment of efforts in lunar and planetary exploration. This subfunction grew in relative importance in space activities between 1969 and 1975 but thereafter has declined somewhat.

Space technology and *supporting space activities* (tracking and data acquisition) both account for relatively small shares of the space total. and both show moderate increases in 1977.

- **Health** represents one of the few functions with a higher average annual growth rate between 1969 and 1974 than in more recent years.

In 1977 a 4-percent decrease for this function, or $100 million, results from the fact that final congressional appropriation action for 1976 took place after submission of the President's 1977 budget, bringing about increases in 1976 in a number of health R&D programs over levels estimated for that year in the budget message and making them higher than the proposed 1977 levels. The share of health in the Federal R&D total is 9.7 percent in 1977, compared with 7.2 percent in 1969.

Biomedical research will account for an estimated 9 out of 10 health R&D dollars in 1977, a somewhat larger share than in 1969. Smaller amounts shown for such areas as cancer research, heart and lung research, and research resources in 1977 reflect the later congressional action on 1976 appropriations. The trend, however, has been for cancer and heart and lung research to grow between 1969 and the present period in shares of the health total while research in many other areas has declined in share of total.

Mental health and *delivery of health care* are expected to receive reduced funding in 1977; both of these areas also reflect lower support than in 1969.

Drug abuse prevention and rehabilitation grew rapidly as a program area between 1969 and 1974 but has since declined considerably.

- **Energy development and conversion** showed a relatively high average annual growth rate between 1969 and 1974 of 13.0 percent, but since then growth has been precipitous. In 1977 energy reflects the second highest absolute rise—$390 million, and the highest relative rise—24 percent, of any function. The energy share in all Federal R&D obligations has risen from 2.1 percent in 1969 to an estimated 8.6 percent in 1977.

Nuclear energy R&D activities constitute more than three-fifths of the energy function in 1977 compared with more than nine-tenths in 1969. The 45-percent increase in support to this area in 1977 is largely derived from fission power reactor development, fusion research and development, fuel cycle, and reactor safety efforts.

Fossil energy activities account for one-fifth of the energy R&D total in 1977, and among these a range of coal utilization programs command leading support. Overall funding is diminished, however. The share within energy in 1976 was almost one-third, compared with slightly more than one-twentieth in 1969.

Solar, geothermal, and advanced energy systems, almost one-tenth of the energy total, is scheduled for a 28-percent increase in 1977, mostly derived from solar energy work. In 1969 no R&D efforts were funded in these areas.

Conservation of energy is expected to grow 34 percent. Work in this area was slight in 1969.

- **Science and technology base** has shown most rapid growth since 1974 and reflects an increase of 14 percent in 1977. Much of this growth has resulted from a recognition of the need to support basic research that might bear on solutions to energy, food, and environmental problems. The share of this function in the overall R&D total has grown from 3.3 percent in 1969 to an estimated 4.2 percent in 1977.

Most of the programs within this function are related to support of basic research in the various fields of science and, in some cases, applied research as well. Basic energy sciences and high-energy physics are also included, as is support of astronomical observatories.

- The **environment** function reflects a slight decline in 1977 from 1976, but during the 1969-77 period R&D activities have tripled. In that timespan the share of environment programs within the Federal R&D total has risen from 2.0 percent to 4.1 percent.

  Environmental health and safety, the leading subfunction, contains a range of programs whose support amounts to two-fifths of the entire environment function in 1977, a slightly larger share than in 1969. The largest program area is biomedical and environmental research to provide data on health and environmental effects of pollutants arising from energy technologies.

  Understanding, describing, and predicting the environment accounts for almost one-third of the environment total in 1977 and covers environmental satellite programs, basic data collection, weather prediction, and special international R&D efforts.

  Pollution control and environmental protection, also nearly one-third of the environment total in 1977, embraces environmental control and quality monitoring. The share of this subfunction in 1969 was nearer to one-fourth.

- **Transportation and communications** R&D programs have risen and fallen over the years, although the long-term trend has been upward—an average annual rate of 5.5 percent. In 1977 a slight drop is indicated. The share of this function within the Federal R&D total shows little change, moving from 2.9 percent in 1969 to an estimated 3.0 percent in 1977 (having reached the 5-percent level in 1971 just before termination of the SST).

  The *air* subfunction, which accounts for three-fifths of the activity within the total function in 1977, is mostly made up of a large aeronautical research and technology program. The *ground* subfunction, which represents more than one-fourth of the total effort, is scheduled to decline, chiefly from curtailed R&D work in highway and railroad transportation. Other subcategories cover *water* R&D programs, *multimodal* programs, and *communications* programs.

- The **natural resources** function shows considerable growth in the current (1975-77) budget period although growth in 1977 is nominal. The share of natural resources programs in all Federal R&D programs has risen from 1.3 percent in 1969 to an anticipated 2.2 percent in 1977.

  This area covers programs primarily devoted to gaining a better understanding and better inventories of natural resources and their most effective and economical management and use. The programs are grouped under *mineral* (almost one-third of the natural resources total in 1977), *water*, *land*, *recreation*, and *multiresource* programs.

- **Food, fiber, and other agricultural products,** a new function category in this report,[5] has almost doubled in support between 1969 and 1977 with an average annual growth of 8.4 percent. R&D obligations for this function represented 1.4 percent of total Federal R&D obligations in 1969 and are expected to represent 1.8 percent in 1977.

[5] Programs within this function were formerly found mainly under a food subfunction within natural resources.

Production, the chief subfunction, is scheduled for an 8-percent gain in 1977, largely in plant research and agricultural experiment station support. The *marketing and distribution* and *other* subfunctions show little change.

- The **education** function has shown a fluctuating level of funding in the 1969-77 timespan, yet a basic growth trend is evident, averaging 4.3 percent annually. Even so, the share of education within the Federal R&D total has actually fallen slightly—from 1.0 percent in 1969 to an estimated nine-tenths of 1 percent in 1977.

  Programs cover research and development in such areas as education and work, educational equity, vocational training, science education, and education for the handicapped.

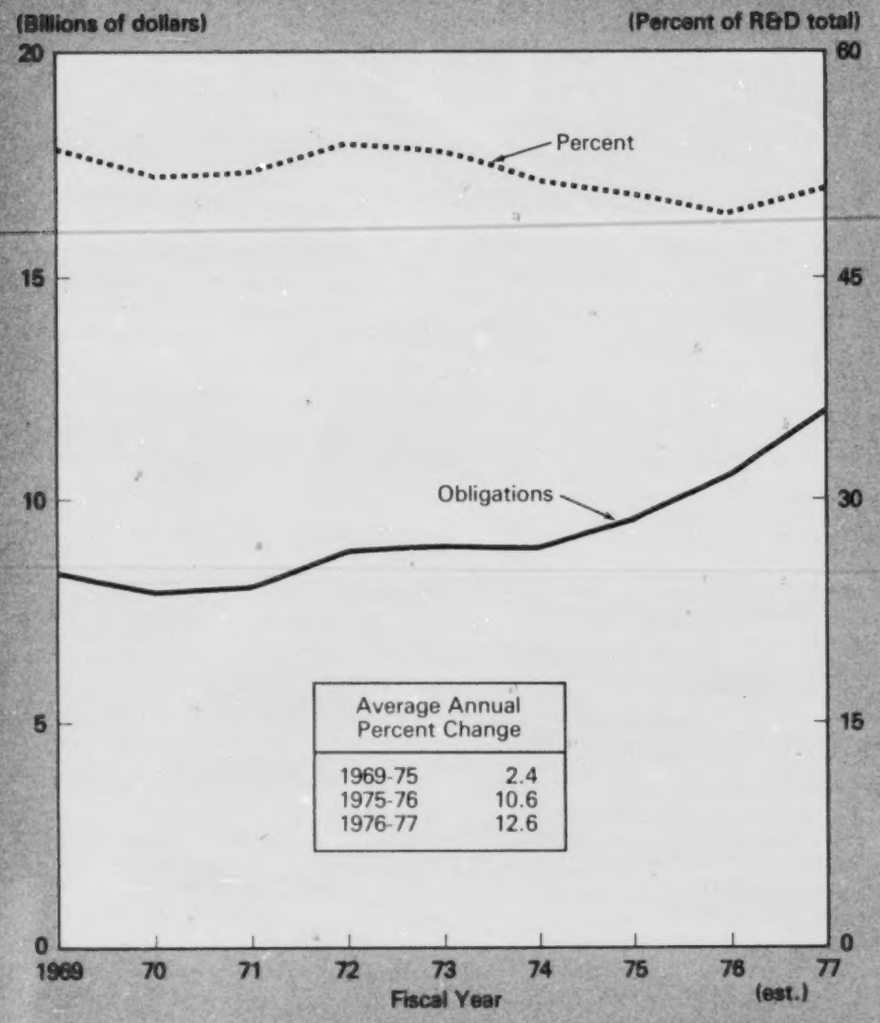
- **Income security and social services** is an area of R&D activity that has varied in support from one year to the next. The current (1975-77) period reflects a steady level of funding each year that is higher than in all previous years except 1973. In that year the share of this function in overall Federal R&D obligations was 1 percent, but in all other years the share has been a fraction of 1 percent. Programs are concerned with social security, rehabilitation, employment training, child development and protection, and public assistance. The emphasis within this function is on programs that benefit the individual.

- **Area and community development, housing, and public services** shows a relatively high average annual growth rate of 13.5 percent between 1969 and 1977, starting from a low original funding level. In 1977 no growth is shown. R&D activities are largely directed to housing research and community development. The emphasis within this function is on improving the economic or social conditions of regions, including urban areas and their public services.
- **Economic growth and productivity** is a function with sporadic growth, which amounts to 4.9 percent on an average annual basis from 1969 to 1977. The many R&D programs that make up this function include forest products utilization research, technology applications, research on the properties and performance of materials—much of it related to standard reference data—and productivity studies.
- The long-term growth of **crime prevention and control** is the most rapid of any function—32.0 percent on an average annual basis between 1969 and 1977. The base amount was low, contributing to the high growth rate. A drop of 31 percent is shown in 1977, mostly as a result of unexpectedly high obligations in 1976 from the carryover of unobligated funds from the previous year.
- **International cooperation and development** is a function with a relatively low growth rate—4.1 percent on the average annually between 1969 and 1977. The chief R&D activity within this function is related to aid to underdeveloped countries.

Part II

FUNCTIONS IN DETAIL

NATIONAL DEFENSE
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

12

NATIONAL DEFENSE

- Obligations for national defense R&D programs have risen and fallen within the 1969-77 period. Since 1974, however, the rise has been steady and yearly increases relatively greater. The only earlier year with an important increase was 1972 when a rise of 10 percent in national defense R&D obligations significantly influenced the overall Federal R&D level.

- Virtually all national defense program areas reflect increases in 1977, bringing the R&D total for this function to $12 billion.

- Despite the estimated dollar increase of 13 percent in 1977, well ahead of anticipated inflation, the share of the national defense function within overall Federal R&D obligations is lower than in 1969. In that year the share was 53.4 percent and in 1977 it is an estimated 51.0 percent.

	1969	1975	1976	1977
		[Dollars in millions]		
National defense, total	$8,353.7	$9,620.9	$10,641.4	$11,987.1
		Percent distribution		
Defense military	92.0%	93.6%	93.0%	93.5%
Missiles and related equipment (DOD-RDT&E)	29.1	22.5	21.4	20.9
Other equipment (DOD-RDT&E)	13.6	19.2	19.7	19.7
Aircraft and related equipment (DOD-RDT&E)	12.6	17.1	18.2	18.9
Programwide management and support (DOD-RDT&E)	5.1	9.2	8.9	8.8
Ordnance, combat vehicles, and related equipment (DOD-RDT&E)	4.2	4.9	5.2	6.3
Ships, small craft, and related equipment (DOD-RDT&E)	4.0	6.6	5.7	6.1
Military astronautics and related equipment (DOD-RDT&E)	12.7	5.5	5.5	4.9
Military sciences (DOD-RDT&E)	7.2	4.2	4.2	4.3
Other DOD-military	3.6	4.5	4.1	3.7
Defense-related atomic energy	8.0	6.4	7.0	6.5
Weapons R&D and testing activities (ERDA)	6.6	4.7	5.0	4.9
Naval reactor development (ERDA)	1.4	1.8	2.1	1.6
Other defense-related activities (OEP)	(1)	—	—	—

(1) Less than 0.05 percent.

SOURCE: National Science Foundation.

Comments

- The **defense military** subfunction includes as its chief program area *missiles and related equipment*, which accounts for one-fifth of all national defense R&D activity in 1977. The missiles area will grow an estimated 10 percent over 1976, bringing the dollar level to $2.5 billion. Programs contributing to the increase include the Navy sea-launched cruise missile, the fleet ballistic missile system, and work on the CSEDS test site for the Aegis shipboard weapon system. The Trident submarine-launched missile system is still a major naval program, but funding is considerably reduced as development enters a later stage.[6]

  For the Army the programs showing greatest expansion are the U.S. Roland short-range air defense system, the Pershing II nuclear strike missile, the ballistic missile defense system technology program, and the BDM advanced technology program.

  Air Force plans include intensified work on advanced ICBM technology, on the air-launched cruise missile, and on aerial target drones even while the Minuteman II/III reflects decreased development effort.

  Other equipment, the next program area in size of support, is scheduled for a 13-percent increase in 1977, to a total of $2.4 billion. This area includes such rapidly expanding programs as the Air Force E-4, advanced airborne command post, almost doubled in effort in 1977, and the Air Force precision location strike system.

  Aircraft and related equipment shows projected growth of 16 percent in 1977 to the $2.3 billion level. The Navy F-18 fighter aircraft is scheduled for the largest dollar increase of any single military program in 1977. Work on the Navy LAMPS helicopter will also increase significantly. The Army AAH advanced attack helicopter

[6] R&D obligations for the DOD portion of national defense include all obligations for the research, development, test, and evaluation (RDT&E) appropriation, except for relatively small amounts used for R&D plant, plus minor amounts of R&D support from other appropriations, primarily pay and allowances of military personnel working in research and development.

The RDT&E funds are broken into program areas, which in this report are treated as subcategories within the defense military subfunction of national defense. Obligations for some program areas show an erratic pattern with sharp increases and decreases. The reason is that development of a new weapons system from initial definition to completion of testing and introduction into the operating forces may take 5 or more years. As the definition phase is completed and the new system moves into full-scale development, steep increases in funding are required, but as this phase nears completion, funding falls off sharply.

reflects plans for a strong increase in effort. Air Force programs that are planned for expansion are the F-16 air combat fighter, the EF 111-A electronic warfare system, and the F-15 Eagle. Continued development is scheduled for the B-1 bomber but at a considerably lower level than in 1976.

Programwide management and support of the Department of Defense (DOD) is expected to grow by 11 percent in 1977, crossing the $1 billion mark. This area has shown a strong growth trend since 1975. For the Army and Navy this activity supports programwide efforts, including technical information, and for the Air Force certain administration costs for the Air Force Systems Command; several test and evaluation centers are also included.

Ordnance, combat vehicles, and related equipment reflects a 35-percent increase in 1977, largely in support of augmented efforts on the Army XM-1 tank system, cannon-launched guided projectile (CLGP), mechanized infantry combat vehicle (MICV), and Bushmaster. The Air Force close air support weapons system (CASWS) will also receive greater R&D funding.

Ships, small craft, and related equipment is expected to expand by 21 percent. A major development effort will continue on surface effect ships, and funding will increase for submarine silencing, improved sonars, and advanced propulsion systems.

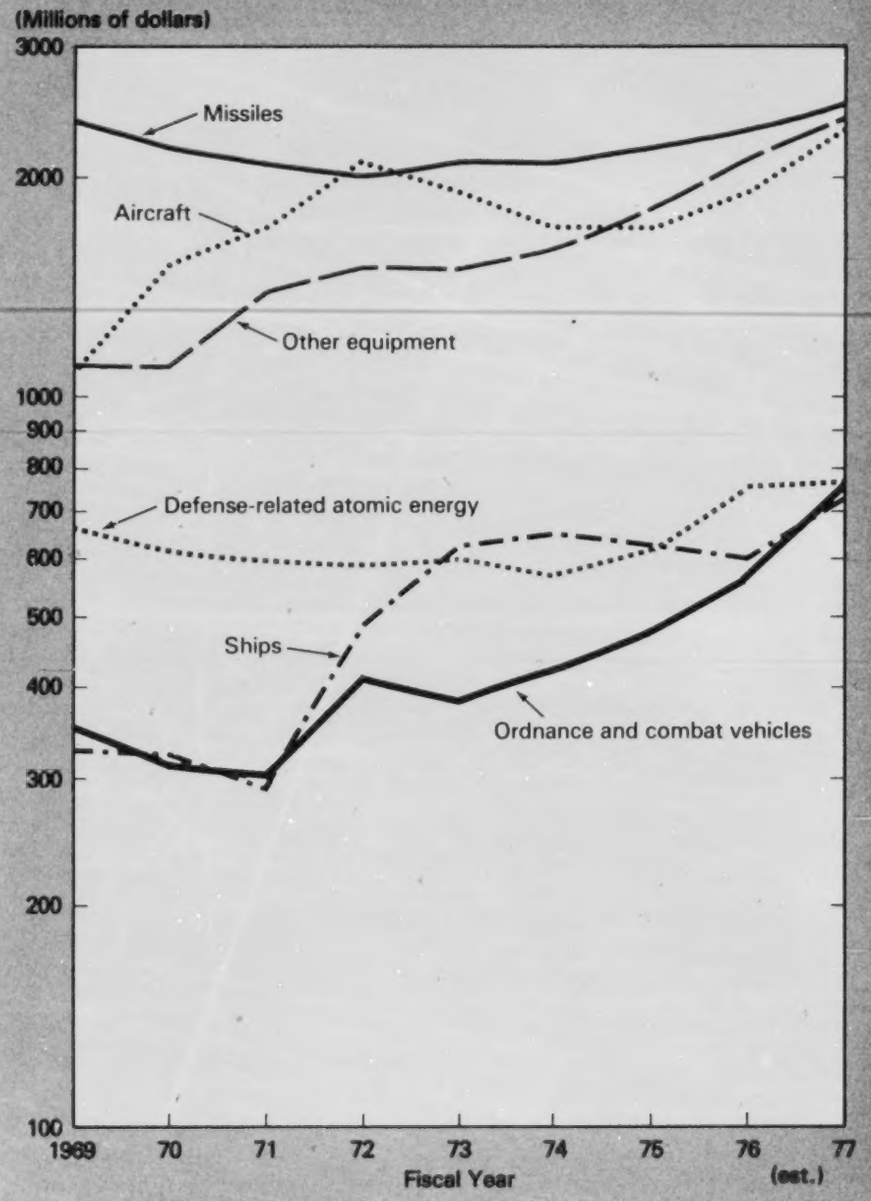
Military astronautics and related equipment changes little in level of support in 1977. Development continues at a reduced level on the Air Force NAVSTAR global positioning system while Air Force efforts on military applications of the space shuttle will increase significantly.

Military sciences reflects a 16-percent increase in support in 1977. This program area provides a basis for the development of future systems and improved operations through support of research in the physical, mathematical, environmental, engineering, biomedical, and behavioral sciences.

Other DOD-military, down slightly in 1977, includes R&D support from other than the RDT&E appropriation, mostly pay and allowances of military personnel working in research and development.

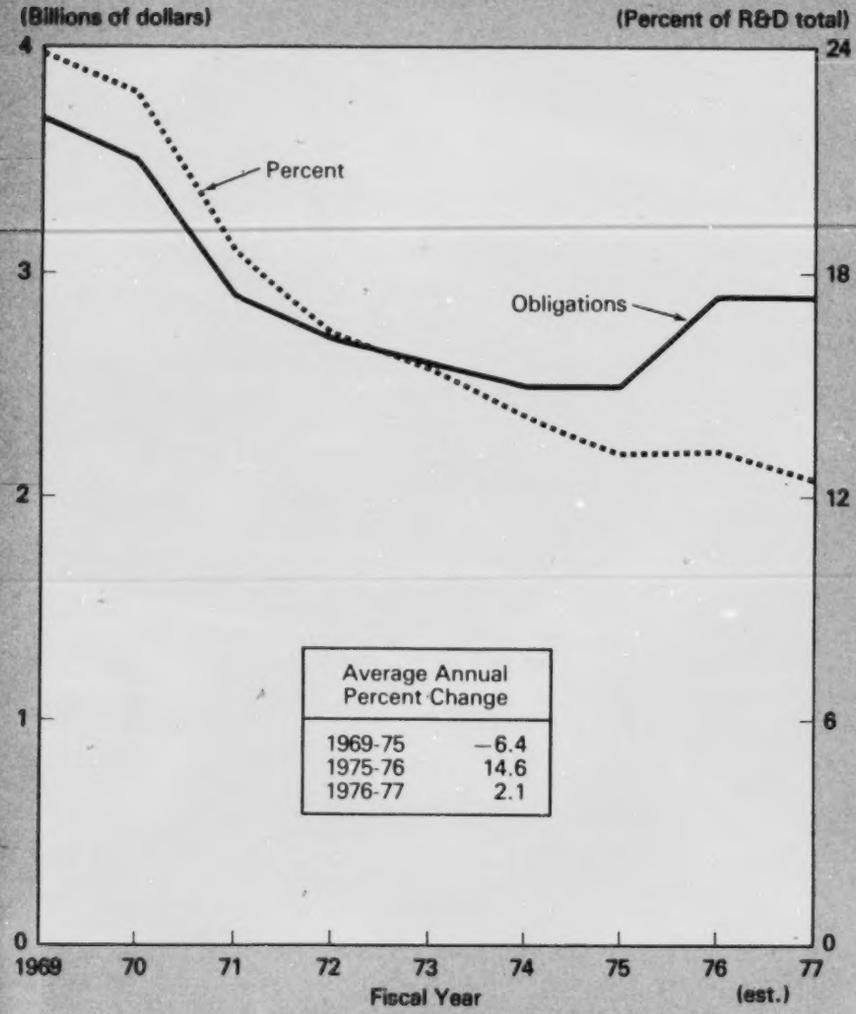
- **Defense-related atomic energy,** the second subfunction, is scheduled for very slight overall growth since an increase in weapons research and development and testing on the part of the Energy Research and Development Administration (ERDA) is partially offset by a decline in funding for ERDA naval reactor development.

NATIONAL DEFENSE
FEDERAL R&D OBLIGATIONS BY SUBFUNCTIONS



SOURCE: National Science Foundation

SPACE
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

SPACE

- Funding for space R&D programs fell steadily from 1969 to 1974, but since then an upward trend has been evident. From 1975 to 1976 a gain of 15 percent is estimated, and for 1977 the increase is 2 percent, bringing the space total to $2.9 billion.

- Space is the only function with lower funding in 1977 than in 1969. New programs, such as the space shuttle, have not offset the steep decline brought about by completion of the Apollo program.

- In 1969 the share of space within the Federal R&D total was 23.9 percent, and in 1977 the share is expected to be 12.5 percent.

	1969	1975	1976	1977
		[Dollars in millions]		
Space, total	$3,731.7	$2,511.3	$2,878.5	$2,940.3
		Percent distribution		
Manned space flight	70.4%	59.8%	63.2%	65.1%
Apollo (NASA)	55.8	—	—	—
Space flight operations (NASA)	4.2	11.9	6.5	7.0
Skylab	3.8	—	—	—
Apollo-Soyuz Test Project	—	4.4	—	—
Other	.5	7.5	6.5	7.0
Space shuttle (NASA)	—	31.6	41.7	43.6
Expendable launch vehicle development and support (NASA)	1.6	3.6	3.4	3.0
Research and program management (NASA)	8.8	12.7	11.6	11.6
Space sciences	10.0	22.6	21.2	18.3
Lunar and planetary exploration (NASA)	2.8	11.2	10.1	7.4
Physics and astronomy (NASA)	4.0	6.0	6.4	6.4
Life sciences (NASA)	1.1	.8	.7	.8
Research and program management (NASA)	2.1	4.6	4.0	3.8
Space technology	10.9	6.2	5.8	6.3
Space research and technology (NASA)	8.4			
Nuclear power and propulsion (NASA)		5.1	4.7	5.3
Space nuclear systems (ERDA)	2.5	1.1	1.1	1.1
Supporting space activities	8.7	11.4	9.8	10.2
Tracking and data acquisition (NASA)	8.7	11.4	9.8	10.2

SOURCE: National Science Foundation

Comments

- **Manned space flight** is the leading space subfunction; in 1977 this area will account for almost two-thirds of the planned space activities. Currently the predominant program is the NASA space shuttle for which development efforts in 1977, involving all major components, will continue toward achievement of the first manned orbital flight in mid-1979.

  The space shuttle is a reusable space vehicle that will operate between the surface of the Earth and Earth orbit. It is designed to retrieve payloads from orbit for reuse, to service or refurbish satellites in space, and to transport to orbit, operate, and return space laboratories.

  Space flight operations programs supplement the space shuttle in that they relate to establishment of a space transportation system (STS) operations capability of which the space shuttle is the key element. The operations capability development efforts include spacelab, interim upper stage, and multiuse mission support equipment.

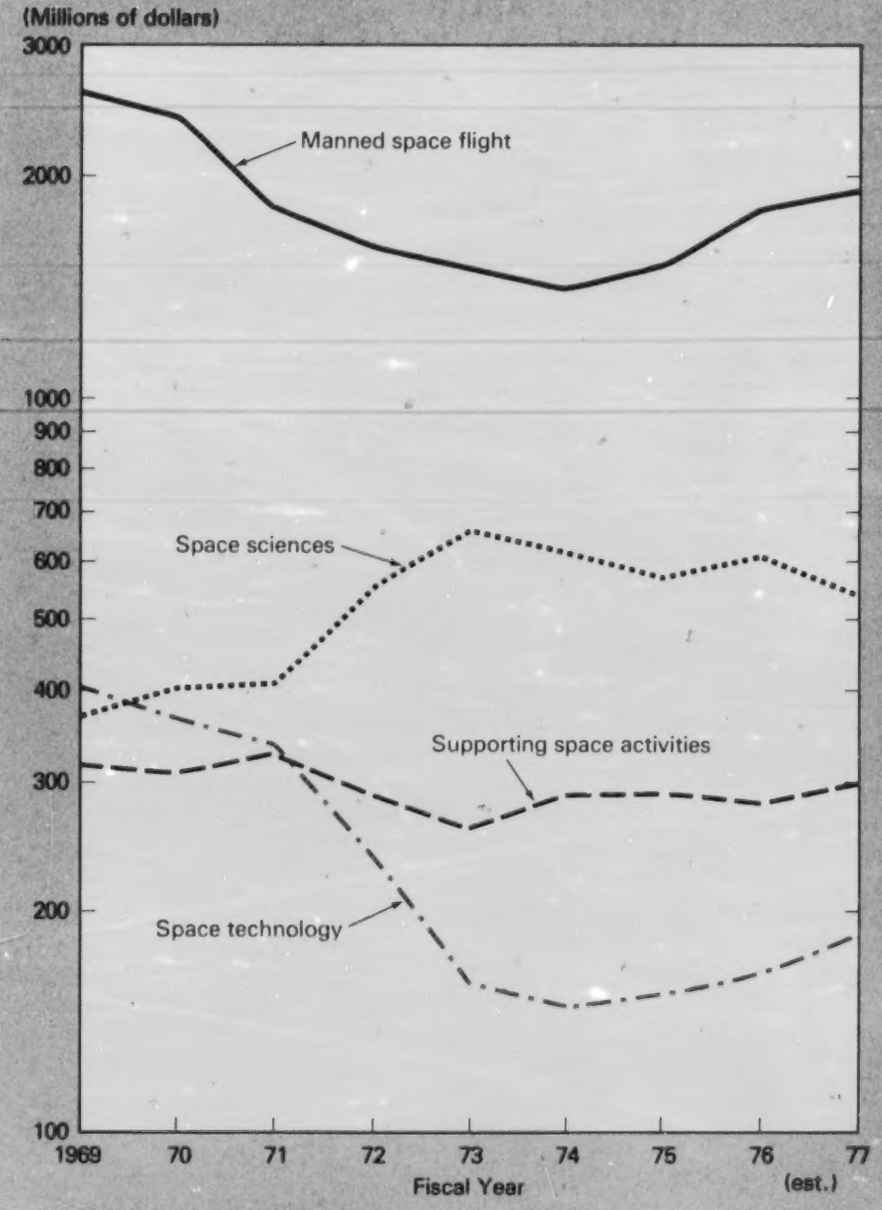
- **Space sciences** is the second largest subfunction, accounting for almost one-fifth of the space total in 1977. This area received yearly increases in support between 1969 and 1973, but since then has tended to decline somewhat. A decrease is indicated for 1977, the result of lower funding for NASA lunar and planetary exploration as the Viking and outer planet missions move beyond the launch stage. Within this broad program area further launches are planned of Pioneer missions to Venus and Mariner missions to Jupiter and Saturn. Helios missions continue to investigate the Sun.

  Under physics and astronomy research is conducted to investigate the Earth's upper atmosphere and ionosphere, the magnetosphere, and the interplanetary medium. Work is continuing on the High Energy Astronomy Observatory (HEAO) series, designed to explore celestial X-ray, gamma ray, and cosmic ray sources. The International Ultra-violet Explorer will be launched in 1977. A solar maximum mission, initiated in the 1977 budget and planned for launch in 1979, will take advantage of the next peak in the solar cycle.

- **Space technology** reflects a real increase in 1977, all generated by NASA's space research and technology program. This effort provides a technology base to support current and future space activities. Work by ERDA on space nuclear systems shows no change for 1977.

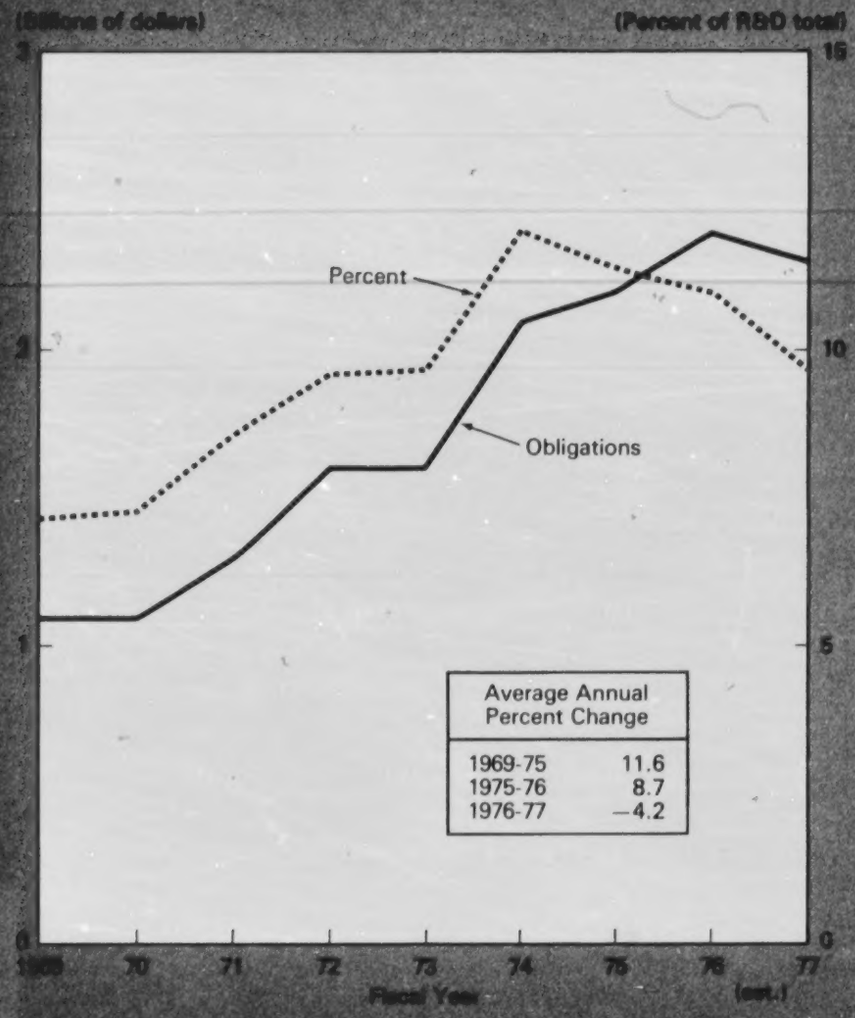
- **Supporting space activities,** moderately increased in 1977, covers the NASA tracking and data acquisition program.

SPACE
FEDERAL R&D OBLIGATIONS BY SUBFUNCTIONS



SOURCE: National Science Foundation

HEALTH
FEDERAL R&D OBLIGATIONS



Average Annual Percent Change	
1969-75	11.6
1975-76	8.7
1976-77	−4.2

SOURCE: National Science Foundation

HEALTH

- Even though health R&D programs register a 4-percent decline to $2.3 billion in 1977, the long-term trend of this function has been upward.[7] In every year from 1970 through 1976 the funding level has risen.

- In 1977 all the health subfunctions reflect reduced support with the greatest relative decrease shown for mental health activities. The chief reason for these decreases is that the President's 1977 budget request for a number of HEW programs, especially those of NIH, was based on lower 1976 levels than were later achieved by final legislative action. Congressional appropriations for 1976 took place after the budget submission, making, in effect, lower estimates for 1977 for a number of programs.

- The share of health R&D support within the Federal R&D total has risen from 7.2 percent in 1969 to an estimated 9.7 percent in 1977.

[7] This function excludes the environmental health component of the environment function. See p. 30.

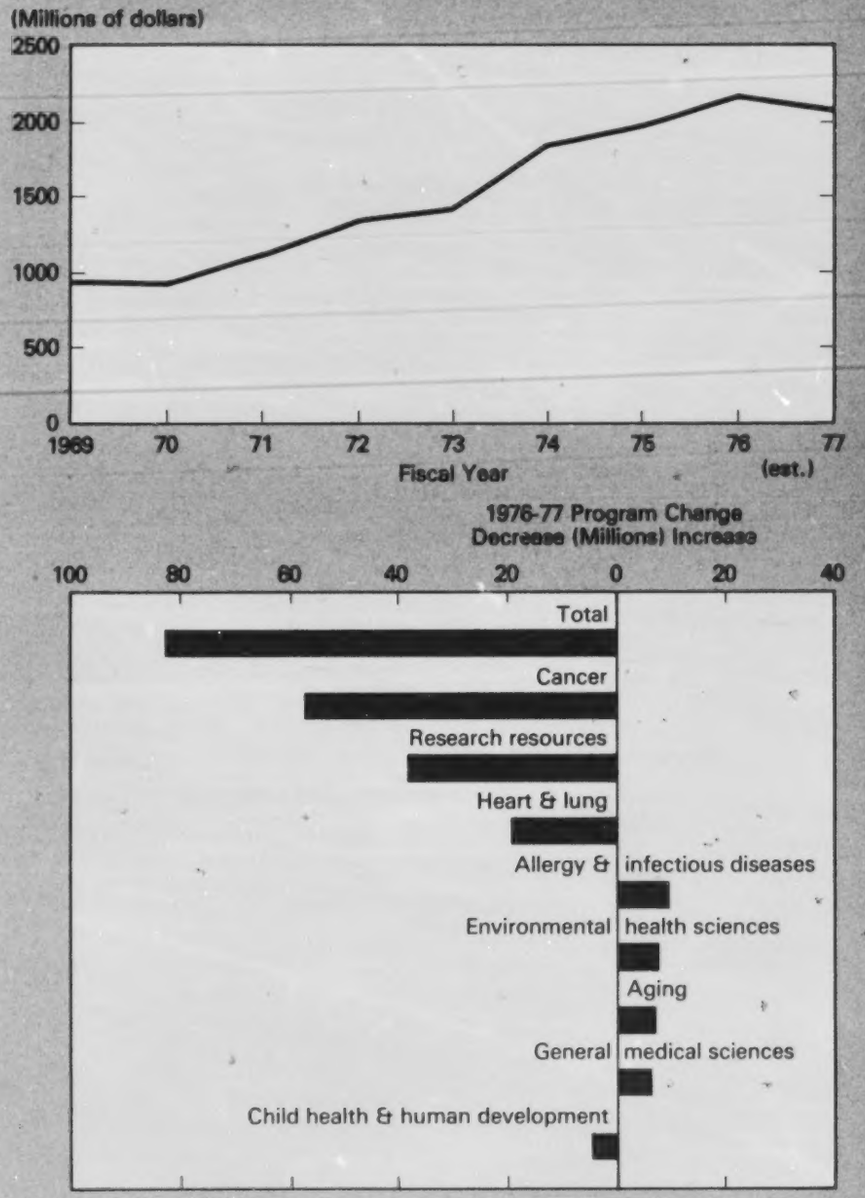
- **Biomedical research** accounts for the predominant share of the health R&D total—92 percent in 1977. This subfunction grew at a faster rate than the overall health function between 1969 and 1976, offsetting long-term declines in the mental health and delivery of health care subfunctions.

Most work in biomedical research is accomplished by the National Institutes of Health (HEW). In 1977 several of these institutes reflect reduced funding because of congressional action on 1976 program levels, notably those institutes concerned with cancer research, heart and lung research, child health and human development research, and research resources. Over the longer term, however, research in these areas has grown rapidly. Between 1969 and 1976 cancer research grew almost twice as fast as biomedical research as a whole, heart and lung research grew somewhat faster, and child health and human development efforts kept pace with the biomedical total. Work in arthritis, metabolism, and digestive diseases, and in neurological problem areas grew less rapidly than overall biomedical research in the same timespan. Work in environmental health sciences, however, was somewhat ahead of overall biomedical growth.[8]

Outside of NIH biomedical research activities are chiefly found in the medical and prosthetic programs of VA, due to decline slightly in 1977; in activities of the Center for Disease Control (HEW), also scheduled for a decline; and in drugs and devices research and toxicological research of the Food and Drug Administration (HEW), scheduled for virtually no change in 1977.

[8] In this report the R&D programs of the National Institute of Environmental Health Sciences (HEW) is shown under the biomedical research subfunction of the health function, whereas in earlier reports they were shown under the environmental health subfunction of the environment function.

BIOMEDICAL RESEARCH



NOTE: All programs shown are those of (NIH) (HEW).
SOURCE: National Science Foundation

19

	1969	1975	1976	1977
	[Dollars in millions]			
Health, total	$1,126.8	$2,178.3	$2,368.3	$2,268.6
	Percent distribution			
Biomedical research	85.0%	90.7%	91.8%	92.2%
National Cancer Institute (NIH) (HEW)	14.7	27.8	28.7	27.4
National Heart and Lung Institute (NIH) (HEW)	12.0	14.1	14.7	14.5
National Institute of Arthritis, Metabolism, and Digestive Diseases (NIH) (HEW)	10.4	7.3	7.4	7.7
National Institute of General Medical Sciences (NIH) (HEW)	8.0	6.2	6.1	6.6
National Institute of Neurological and Communicative Disorders and Stroke (NIH) (HEW)	9.1	6.0	5.8	6.2
National Institute of Allergy and Infectious Diseases (NIH) (HEW)	7.0	5.1	5.0	5.6
National Institute of Child Health and Human Development (NIH) (HEW)	5.1	6.0	5.3	5.4
Medical and prosthetic research (VA)	4.5	4.3	4.2	4.3
Division of Research Resources (NIH) (HEW)	7.1	5.8	5.5	4.1
National Institute of Dental Research (NIH) (HEW)	1.9	2.0	1.9	2.1
National Institute of Environmental Health Sciences (NIH) (HEW)[1]	1.2	1.5	1.5	1.9
National Eye Institute (NIH) (HEW)	(4)	1.8	1.9	1.9
National Institute on Aging (NIH) (HEW)	(3)	(3)	.7	1.1
Disease control (CDC) (HEW)	1.4	.6	.8	.7
Office of the Director (NIH) (HEW)	—	.7	.6	.6
Drugs and devices (FDA) (HEW)	.7	.6	.6	.6
National Center for Toxicological Research (FDA) (HEW)	—	.4	.3	.3
Other	1.8	.6	.6	.9
Mental health	8.9	4.3	4.1	3.7
Mental health research (ADAMHA) (HEW)	8.9	4.3	4.1	3.7
Delivery of health care	4.7	2.7	2.2	2.2
Health services research and evaluation (HRA) (HEW)	3.7	1.7	1.4	1.5
Maternal and child health services (HSA) (HEW)	.6	.3	.2	.2
Patient care and special health services (HSA) (HEW)	.2	.1	.1	.2
Family planning services (HSA) (HEW)	—	.1	.1	.1
Other	.3	.4	.4	.2
Drug abuse prevention and rehabilitation	1.4	2.3	2.0	2.0
Drug abuse research (ADAMHA) (HEW)	.9	1.6	1.4	1.5
Alcoholism research (ADAMHA) (HEW)	.4	.5	.5	.4
Other	—	.2	(4)	(4)

[1] Formerly included under environmental health within the environment function.
[3] Included within the National Institute of Neurological Diseases and Stroke.
[3] Includes within the National Institute of Child Health and Human Development.
[4] Less than 0.05 percent.

SOURCE: National Science Foundation.

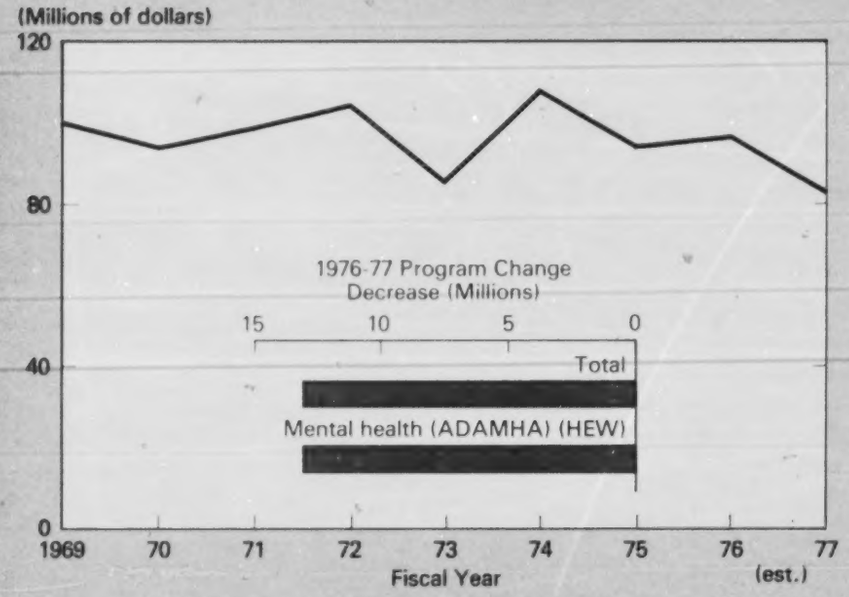
- **Mental health** reflects an actual decline in funding between 1969 and 1977 with the high point occurring in 1974. As a share of the health R&D total this activity has declined from 9 percent in 1969 to an estimated 4 percent in 1977.

This work is entirely under the sponsorship of the National Institute of Mental Health in HEW's Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The Institute supports basic and applied research in the behavioral sciences, psychopharmacology, and specific mental disorders as well as in the epidemiology of mental illness. Major emphasis is given currently to depression, child mental health, mental health of the aged, and schizophrenia.

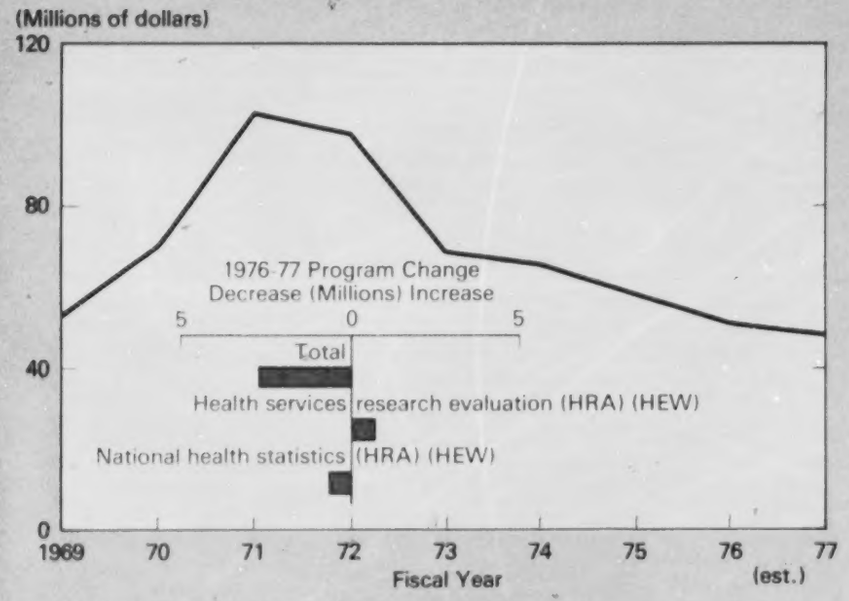
- **Delivery of health care** is another health subfunction that shows an actual decline in funding between 1969 and 1977. As a share of the health total this activity has declined from 5 percent to 2 percent in that period. The chief program area is health services research and evaluation within the Health Resources Administration of HEW. Research is devoted to improving the organization, delivery, quality, and financing of health services; no appreciable change in level of funding is planned for 1977.

The next largest program is concerned with maternal and child health and is found within the Health Services Administration (HEW). No change in support is expected in 1977. Current work under the broad objective of improving the health of mothers and children in the Nation is centered on infant mortality, nutritional needs of preschool children, children's prostheses, and health needs of adolescent pregnant girls.

MENTAL HEALTH



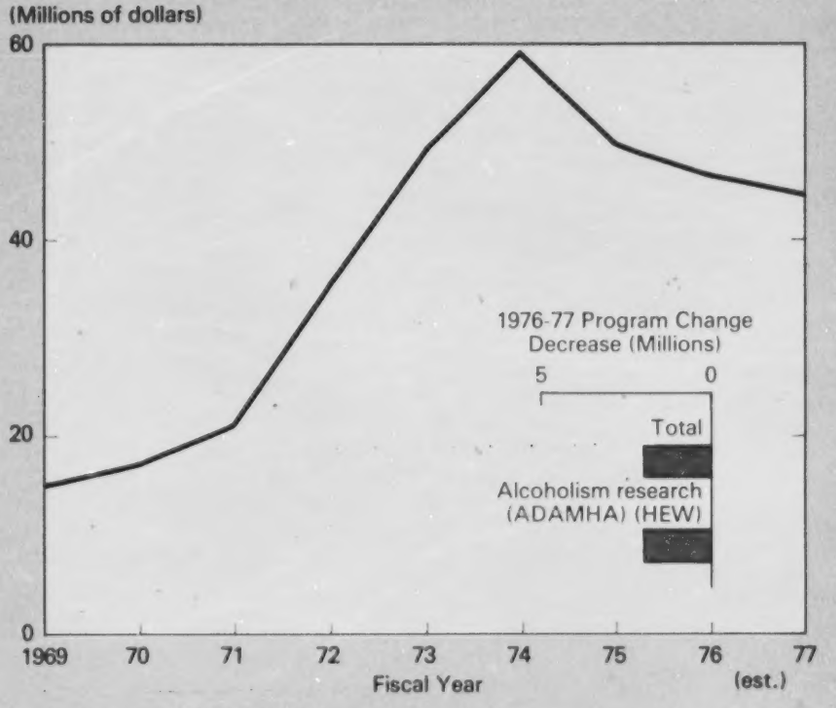
DELIVERY OF HEALTH CARE



SOURCE: National Science Foundation

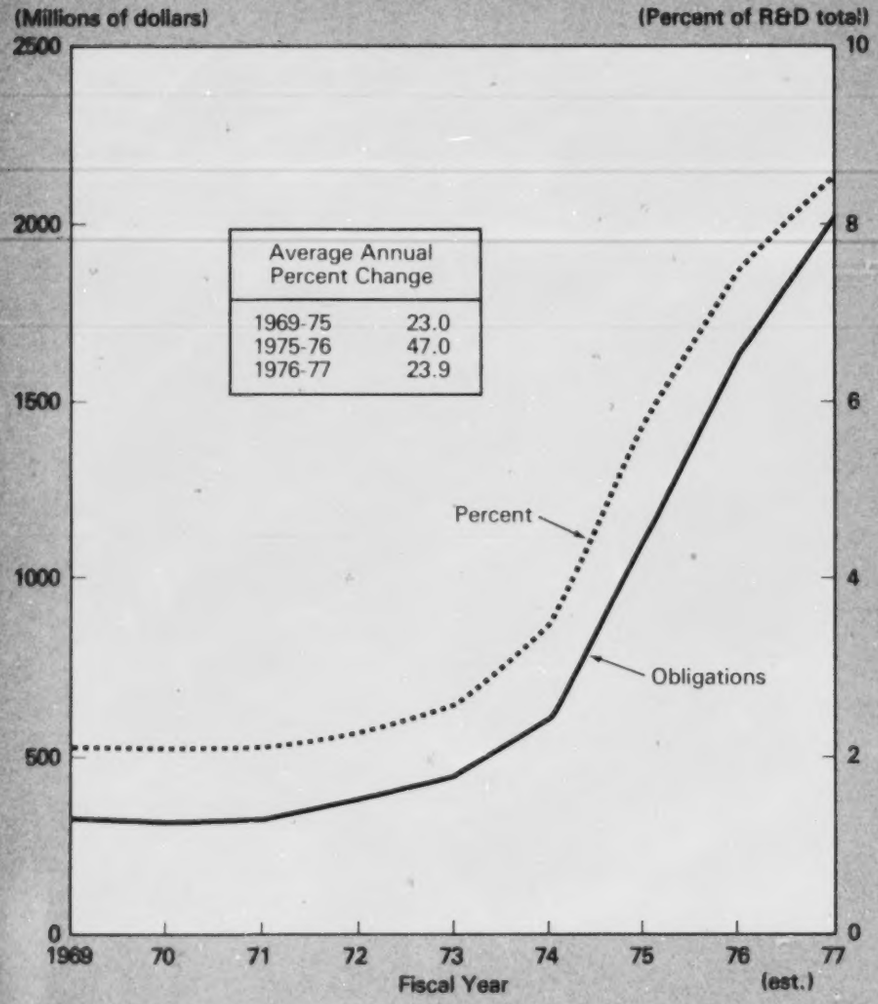
- **Drug abuse prevention and rehabilitation** shows a slight decline in research activity in 1977, part of a longer term decline that began in 1975. Between 1969 and 1974 this subfunction was the fastest growing within the whole health function. Since then a special agency on drug abuse prevention has been phased out, and the research of the National Institute on Drug Abuse of ADAMHA has remained on the same level, while funding for the National Institute on Alcohol Abuse and Alcoholism of ADAMHA has actually declined.

DRUG ABUSE PREVENTION AND REHABILITATION



SOURCE: National Science Foundation

ENERGY DEVELOPMENT AND CONVERSION FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

ENERGY DEVELOPMENT AND CONVERSION

- Energy development and conversion is the leading growth area in Federal R&D funding. By 1975 total funding had passed the $1 billion mark, and in 1977 it is expected to move beyond $2 billion.[9] The 24 percent gain in 1977 is the largest relative gain for any function.

- Over the longer term the average annual growth rate of 26.0 percent between 1969 and 1977 is the highest of any major function. Funding for energy R&D programs began to rise significantly in 1972 and by 1974 were rising precipitously. In 1975, 1976, and 1977 the relative yearly gains for the energy function have been far higher than for any other function.

- In 1969 energy development and conversion represented 2.1 percent of the Federal R&D total, and in 1977 this function is expected to represent 8.6 percent.

---

[9] The Office of Management and Budget and the Energy Research and Development Administration both have cited higher Federal totals for energy R&D activities in 1976 and 1977 than are shown in this report: $1.9 billion and $2.7 billion, respectively ($2.6 billion was cited for 1977 by OMB). Differences arise not only from the fact that R&D plant data are included in the OMB/ERDA figures but also from the fact that they are based on budget authority rather than obligations and include as well some program elements that would be regarded in this report as belonging under functions other than energy. In this report each program is assigned to a functional area on the basis of its primary purpose; e.g., an energy-related program whose primary purpose is environmental protection would be assigned to the environment function and would not appear under the energy function. In this report the energy totals for 1976 and 1977 would be $1.9 billion and $2.5 billion, respectively, if R&D plant were included. See Office of Management and Budget, *Special Analysis P: Federal Research and Development Programs, The Budget 1977*, 1976, p. 278 and Energy Research and Development Administration, *A National Plan for Energy Research, Development, and Demonstration: Creating Energy Choices for the Future, 1976, Volume I: The Plan*, 1976, p. 18 (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office).

	1969	1975	1976	1977
	[Dollars in millions]			
Energy development and conversion, total	$327.9	$1,109.7	$1,631.5	$2,021.1
	Percent distribution			
Nuclear	93.3%	60.8%	53.7%	62.8%
Fission power reactor development (ERDA)	[r]63.8	34.1	27.3	31.2
Magnetic fusion (ERDA)	8.1	8.8	8.1	8.3
Fuel cycle research and development (ERDA)	8.0	3.1	4.0	8.1
Uranium enrichment-process development (ERDA)		3.0	3.0	3.1
Reactor safety research (NRC)	7.5	5.4	5.0	4.4
Laser fusion (ERDA)	(1)	4.1	4.0	3.5
Advanced isotope separation techniques (ERDA)	—	1.9	1.8	1.8
Reactor safety (ERDA)	—	—	—	1.6
Other	6.0	.4	.5	.7
Fossil	6.1	24.3	29.9	20.9
Coal utilization (ERDA)	4.6	20.6	25.6	17.5
Petroleum and natural gas (ERDA)	.8	2.3	2.8	1.8
In situ technology (ERDA)	.7	.9	1.4	1.5
Other	—	.4	.1	(2)
Solar, geothermal, and advanced energy systems	—	7.5	9.1	9.4
Solar energy development (ERDA)	—	3.6	6.8	7.0
Geothermal energy development (ERDA)	—	2.3	2.0	2.4
Other	—	1.6	.3	—
Conservation	.6	5.8	6.1	6.6
End use conservation and technologies to improve efficiency (ERDA)	—	.9	2.5	3.5
Electrical systems and energy storage (ERDA)		2.2	2.1	2.1
Improvements in power systems technology (TVA)	(2)	.6	.5	.5
Energy conservation (OS) (DOT)	—	.5	.3	.3
Other	.6	1.6	.6	.2
Other	—	1.7	1.3	.3
Federal Energy Administration	—	.1	.2	.3
Energy programs (NASA)	—	1.2	1.0	—
Energy systems (RANN) (NSF)	—	.4	.1	—

[1] Laser fusion was included in weapons R&D and testing activities prior to 1974.
[2] Less than 0.05 percent.

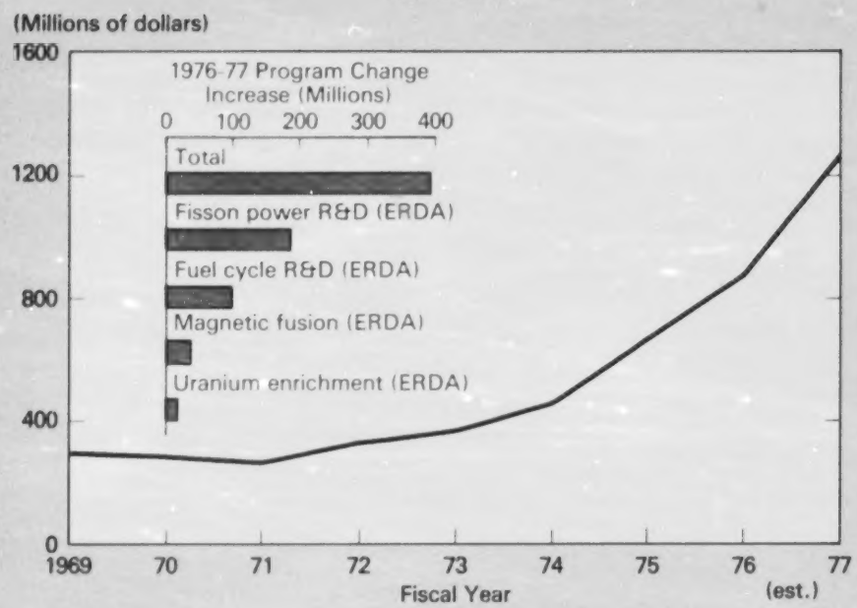
SOURCE: National Science Foundation.

Comments

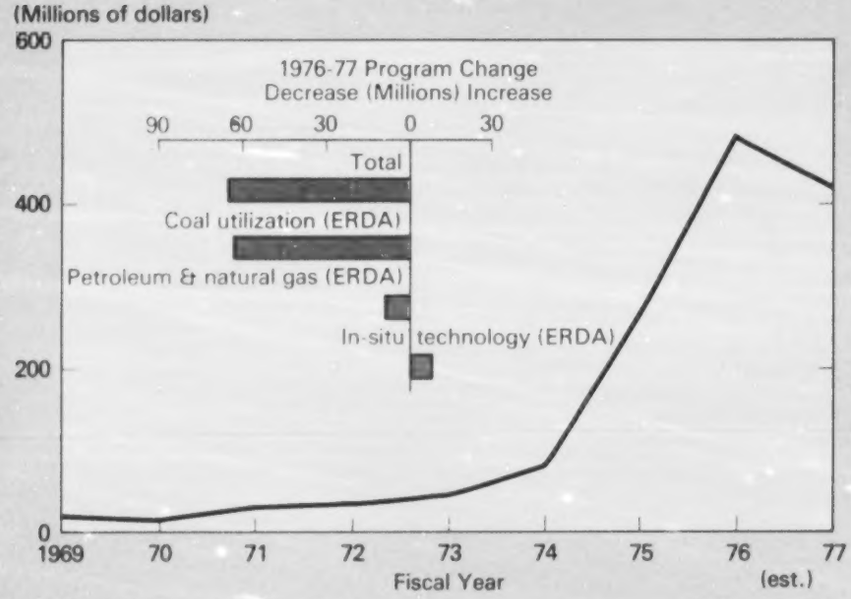
- The **nuclear** subfunction continues to represent the leading area of energy R&D activity. In 1977 support to this area is an estimated 63 percent of the energy total compared with 54 percent in 1976 (and 93 percent in 1969). The chief program area contributing to the upward emphasis is ERDA's fission power reactor development, which will grow an estimated 42 percent to make up one-half of the entire nuclear subfunction in 1977. Under this heading the major effort is related to development of the liquid metal fast breeder reactor (LMFBR) with the aim of demonstrating to utilities acceptable technology in terms of safety, reliability, economy, and environmental impact. Efforts will also continue on the part of ERDA on advanced water breeder applications and on gas-cooled reactors.

The ERDA fuel cycle research and development program, more than doubled in 1977, is a corollary to the agency's reactor development activities. The 1977 request includes (1) uranium resource assessment, discovery, and production activities; (2) work on spent reactor fuel reprocessing, on recycle of recovered uranium and plutonium, and on radioactive process waste treatment; and (3) development of concepts for long-term isolation and disposal of waste products.

NUCLEAR



FOSSIL



SOURCE: National Science Foundation

24

Another strongly supported nuclear program, also under ERDA, is magnetic fusion, up 28 percent in 1977. This program is directed toward demonstrating safe, economical, and reliable energy production from the nuclear fusion process with current emphasis placed on various approaches to the magnetic refinement of fusion plasmas.

Also receiving increased support is the ERDA laser fusion program to determine the feasibility of laser- and electron-beam-initiated thermonuclear burn.

The reactor safety research program of NRC is scheduled for moderate growth. The purpose here is to arrive at analytical methods for assessment of the safety of nuclear power reactors. To support this program ERDA has requested funds in 1977 to build experimental test facilities.[10]

- **Fossil** energy programs make up the second largest subfunction, approximately one-fifth of all energy R&D support in 1977. Coal utilization is by far the most important program area under this heading, covering a number of ERDA programs. These involve conversion of coal to liquid and gaseous fuels, improved methods for direct combustion of coal, and development of power conversion systems utilizing high-efficiency technologies for generating electricity from coal. The overall decline in 1977 for the coal utilization program results from completion of high-cost construction phases of pilot plants (expendable in nature and developed in the process of construction, thus within the R&D rather than R&D plant category). Several demonstration projects show important increases.

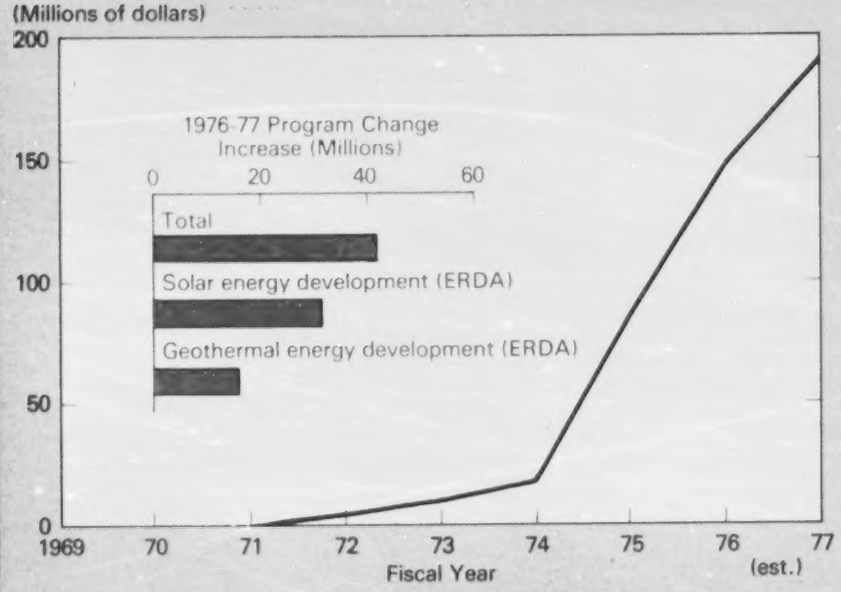
The 1977 decrease for ERDA's petroleum and natural gas program reflects the lesser number of field tests to be initiated in fluid injection and fracturing methods for oil and gas extraction.

The rise in ERDA's in situ technology program is primarily related to further work on oil shale recovery problems.

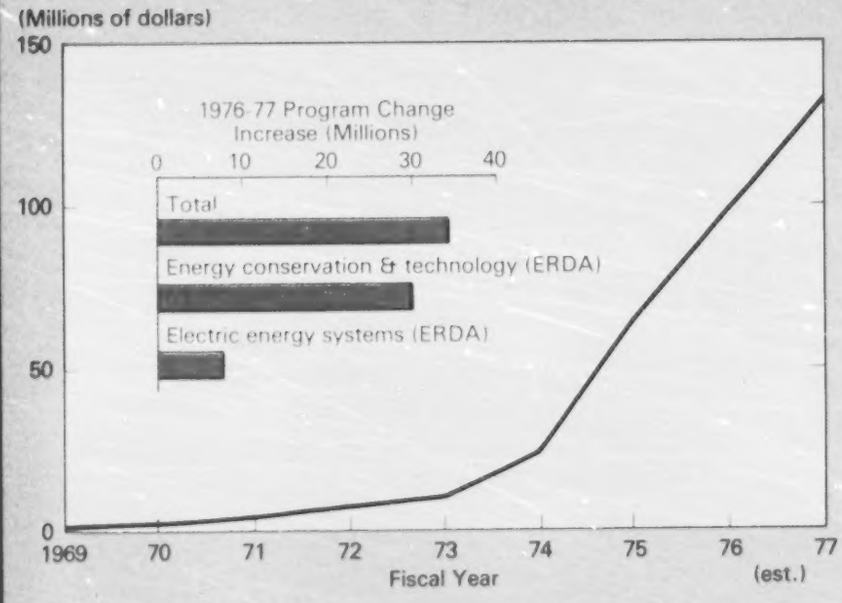
---

[10] These are considered to be expendable equipment and therefore not part of R&D plant.

SOLAR, GEOTHERMAL, AND ADVANCED ENERGY SYSTEMS



CONSERVATION



SOURCE: National Science Foundation

- **Solar, geothermal, and advanced energy systems** is a subfunction in which solar energy development on the part of ERDA holds the dominent position. This broad program, scheduled for an increase of 28 percent in 1977, encompasses solar electric applications (mostly thermal electric conversion activities) and photovoltaic energy conversion as well as demonstrations of solar heating and cooling systems for buildings.

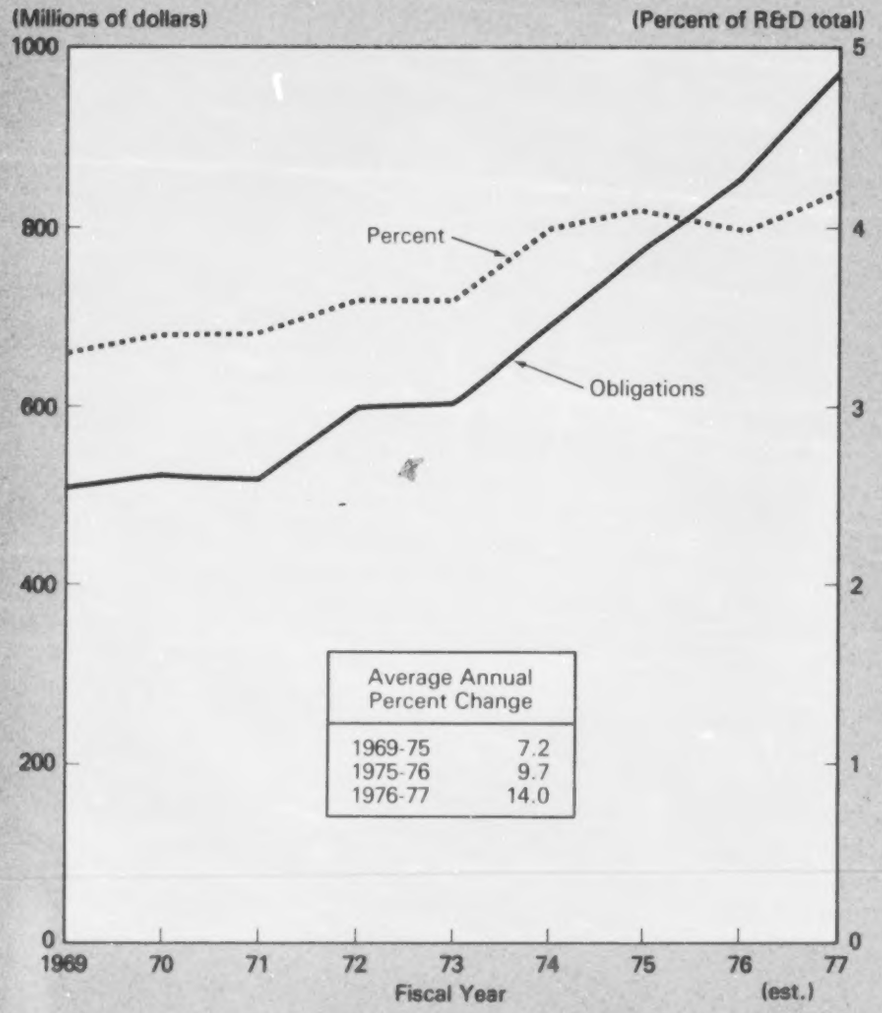
  ERDA's geothermal energy development program, up 48 percent in 1977, will cover work to develop key technology to identify, evaluate, extract, and convert geothermal resources to usable energy forms, such as electricity.

- **Conservation** of energy, the fourth largest energy subfunction, is expected to expand by 34 percent in 1977. The leading program is a broad ERDA effort under the heading of end-use conservation and technologies to improve efficiency. The 73-percent increase requested for 1977 covers energy saving methodologies for industry, buildings, and transportation, and development of energy techniques applicable to the end-use sectors.

  Another important program is ERDA's electric energy systems and energy storage, up 22 percent.

- **Other** energy efforts are currently confined to those of the Federal Energy Administration. A NASA program involving energy activities related to aerospace technology is being placed entirely on a reimbursable basis in 1977. While the work will continue, it will appear under the sponsorship of the agencies who contract for it and under another energy subfunction.

SCIENCE AND TECHNOLOGY BASE
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

- Science and technology base reflects a relatively high growth rate in 1977—14 percent. The average annual rate of growth between 1969 and 1977 is 8.4 percent, but most of this increase represents a strongly rising trend that began in 1974.

- This function covers support to basic research in the various fields of science, as well as some applied research, where the chief purpose is to support research as a source of national scientific strength rather than to support agency mission objectives. Some research that provides the basis for development of future systems and technologies is also included.

- For 1969 the share of science and technology base in the Federal R&D total was 3.3 percent, and in 1977 it is expected to be 4.2 percent.

	1969	1975	1976	1977
	[Dollars in millions]			
Science and technology base, total	$513.4	$781.3	$857.0	$976.6
	Percent distribution			
Basic energy sciences (ERDA)	25.0%	19.9%	20.3%	18.7%
High-energy physics (ERDA)	23.1	17.4	17.8	17.2
Physics research project support (NSF)	5.0	5.6	5.5	5.9
Physiology and cellular and molecular biology research project support (NSF)	5.4	5.6	5.5	5.8
Materials research project support (NSF)	1.5	5.8	5.7	5.8
Engineering research project support (NSF)	3.1	4.6	4.4	4.8
National Research Centers (NSF)	4.8	4.7	5.2	4.8
Chemistry research project support (NSF)	3.5	4.4	4.3	4.5
Environmental biology research project support (NSF)	1.4	3.5	3.4	3.5
Basic research support (Smithsonian)	2.9	3.2	3.2	3.4
Behavioral and neural sciences research project support (NSF)	1.6	2.5	2.4	2.6
Social sciences research project support (NSF)	2.1	2.4	2.2	2.3
Mathematical sciences research project support (NSF)	2.5	2.2	2.1	2.2
Basis for national physical measurement system (NBS) (Commerce)	3.2	2.4	2.5	2.2
Earth sciences research project support (NSF)	1.5	1.7	1.7	2.0
Oceanography research project support (NSF)	2.1	2.0	1.9	2.0
Atmospheric sciences research project support (NSF)	1.6	1.8	1.8	2.0
Support of oceanographic facilities operations (NSF)	1.7	2.1	1.9	1.9
Other	8.0	8.1	8.2	8.5

SOURCE: National Science Foundation

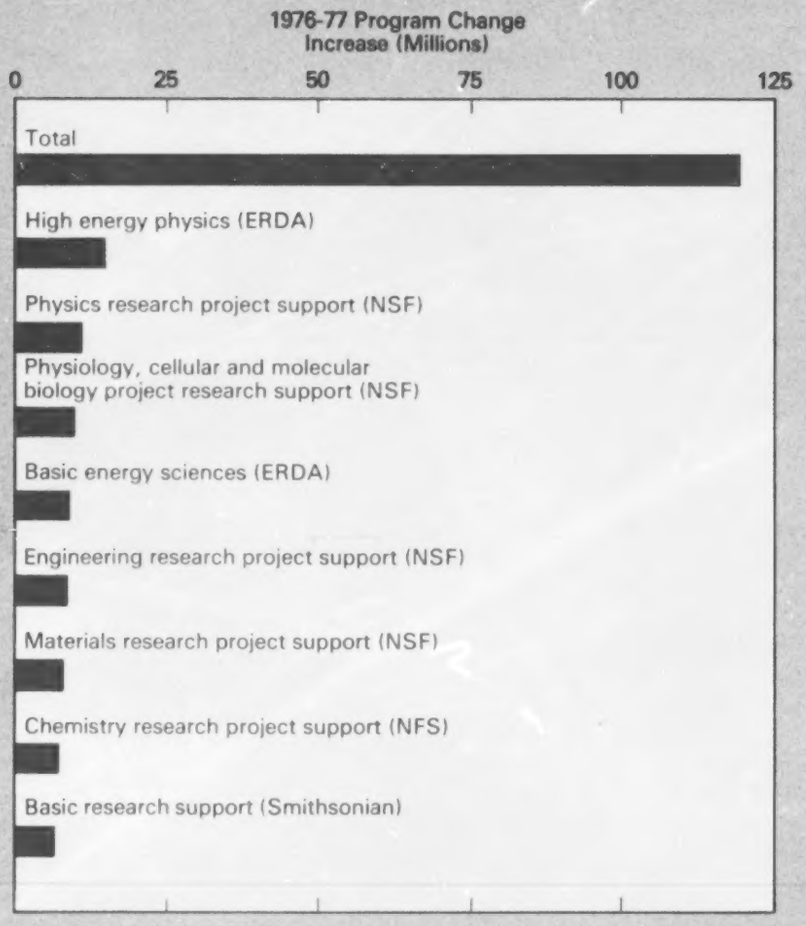
- ERDA support to basic energy sciences accounts for almost one-fifth of the science and technology base function in 1977. This broad program is directed toward scientific understanding of physical phenomena basic to the energy technologies of ERDA programs. A small relative increase in 1977 sustains ongoing studies in the nuclear, materials, and molecular sciences.

Another ERDA program, high-energy physics, is next in size of support. The 10-percent rise in 1977 will continue efforts toward understanding the basic forces of nature through which all physical processes occur. Much of the funding is directed to work at accelerator facilities.

NSF research project support to physics is the largest of any of the 14 research project areas supported by this agency. Almost as much support in 1977 is given to physiology and cellular and molecular biology. The same is the case for materials research support. Each of the first two areas is scheduled for a major increase in 1977—more than 20 percent—while materials research is scheduled to receive a 15-percent increase. Engineering research project support and chemistry research project support, next in size of funding, are both also expected to receive substantial increases.

On a collective basis, the five National Research Centers supported by NSF show only a slight increase in 1977. Of these only the National Radio Astronomy Observatory is scheduled for an important relative rise in funding.

SCIENCE AND TECHNOLOGY BASE



SOURCE: National science Foundation

28

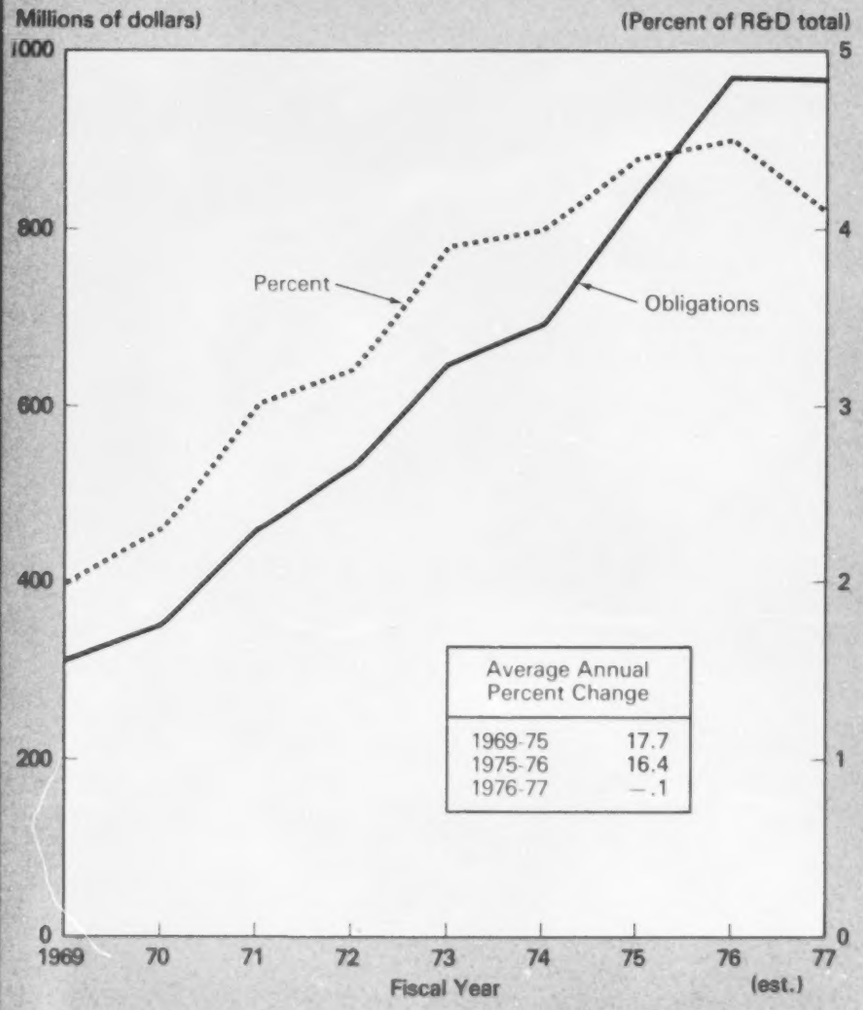
Other NSF research project support areas include environmental biology, behavioral and neural sciences, social sciences, and mathematical sciences, to name the larger ones. All 14 research project support areas show plans for increased funding in 1977.

Basic research support on the part of the Smithsonian Institution covers biology, astronomy, anthropology, and the environmental sciences (geology, oceanography, and the atmospheric sciences). Overall support in 1977 is increased 23 percent.

The National Bureau of Standards (Commerce) has for many years conducted research and development to ensure that users of science and technology in the United States will be able to make physical measurements with the required accuracy, yielding the same results over time, and reconcilable with other like measurements made elsewhere. This overall program shows virtually no change in 1977.

The remaining programs within science and technology base cover some specially targeted NSF programs, such as the ocean sediment coring program, patent activities within Commerce, R&D activities of the Library of Congress, and a recent NASA program—materials processing in space.

ENVIRONMENT
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

ENVIRONMENT

- The environment function shows no growth, overall, in 1977 since program decreases offset program increases. Growth over the 1969-77 period, however, has been rapid, especially in recent years.

- Every major R&D support agency is involved in environment efforts, and, therefore, a very large number of programs are subsumed under this heading.[11]

- The share of environment within the Federal R&D total has grown from 2.0 percent in 1969 to an estimated 4.1 percent in 1977.

[11] The natural resources function also contains a large number of programs, and many of these could logically be placed in either category. A guiding principle was established of assigning programs primarily devoted to studying, inventorying, and managing resources to natural resources and assigning those primarily devoted to studying interactions within systems or studying the nature of pollutants and their effects on living systems to environment.

	1969	1975	1976	1977
	[Dollars in millions]			
Environment, total	$315.2	$837.4	$974.6	$974.0
	Percent distribution			
Environmental health and safety	37.9%	33.8%	40.0%	41.3%
Biomedical and environmental research (ERDA)	28.2	17.0	17.9	18.8
Pollution effects research (EPA)	—	4.9	9.8	9.1
National Institute for Occupational Safety and Health (CDC) (HEW)	4.8	3.5	3.2	3.7
Health and safety research (Bu. of Mines) (Interior)	.7	3.8	3.6	3.6
Environmental and fuel cycle research (NRC)	—	.3	1.5	1.6
Food safety research (FDA) (HEW)	—	1.2	1.1	1.1
Other	4.2	3.1	3.0	3.4
Understanding, describing and predicting the environment	36.4	28.7	27.2	29.5
Environmental satellite programs (NASA)	23.3	12.1	10.9	11.1
Environment-related programs (NSF)	3.4	5.9	6.2	8.0
Environment programs (NOAA) (Commerce)	7.3	6.2	5.4	5.7
Other R&D programs (NOAA)	.9	2.0	2.4	2.3
Other	1.5	2.5	2.2	2.3
Pollution control and environmental protection	25.8	37.5	32.8	29.2
Energy-related environment control programs (EPA)	—	9.6	10.7	6.0
Water quality control (EPA)	10.7	5.9	4.9	3.8
Environmental quality monitoring (NASA)	—	4.7	3.3	4.1
Air quality control (EPA)	10.2	5.7	3.9	3.1
Nuclear materials security and safeguards (ERDA)	.8	.7	1.4	2.6
Interdisciplinary studies (EPA)	—	2.3	1.8	2.3
Other	4.1	8.5	6.8	7.2

SOURCE: National Science Foundation

Comments

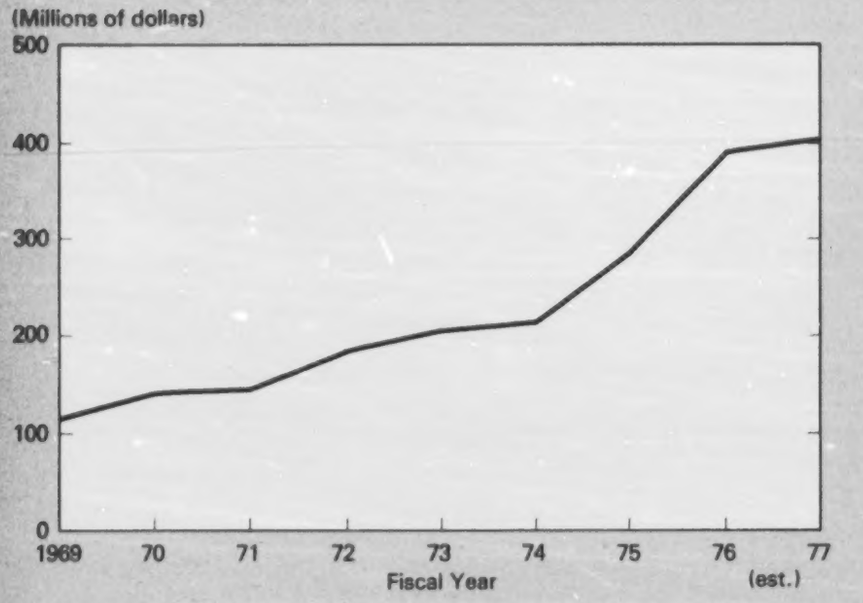
- The **environmental health and safety** subfunction has in 1976 and 1977 regained its position as the most heavily funded area within the environment function, making up more than two-fifths of the total. The major contribution to increased funding of environmental health since 1974 has been made by the ERDA biomedical and environmental research program. This program provides data on the health and environmental effects of pollutants released by on-line and developing energy technologies. Current emphasis is on environmental policy analysis and nonnuclear technologies, primarily those involving fossil fuels.

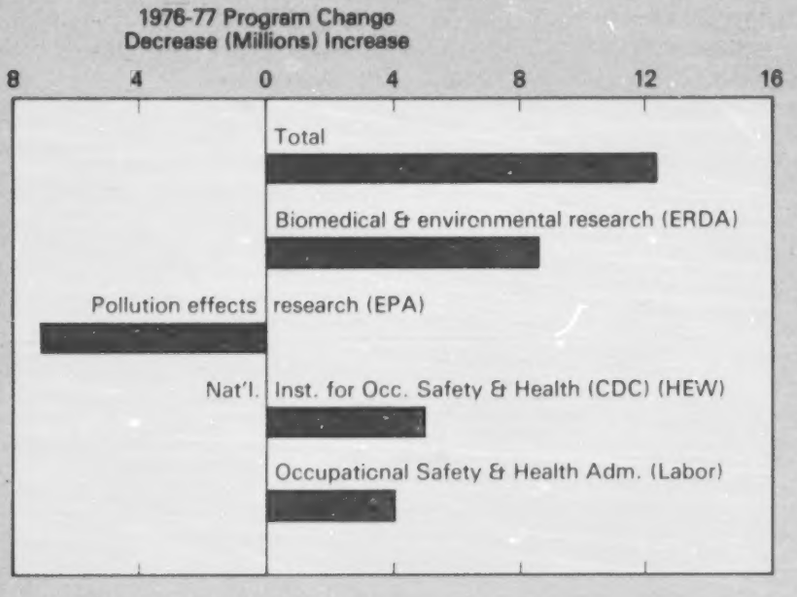
A group of eight EPA pollution effects research programs have figured importantly in Federal environmental health R&D efforts since 1972. Between that year and 1977 support to these programs has grown more than six times, even though a drop is scheduled from the 1976 level. Energy-related environmental effects research, the largest program, is reduced somewhat as is air quality effects research, the second-largest program. All these programs are involved in determining the health and ecological effects of pollutants.

The National Institute for Occupational Safety and Health (NIOSH) of HEW's Center for Disease Control (CDC) has had a steadily growing program to provide the research base for Federal efforts to assure safe and healthful working conditions.

Health and safety research of the Bureau of Mines (Interior) grew rapidly between 1969 and 1972 and is currently at about the same funding level as NIOSH.

ENVIRONMENTAL HEALTH AND SAFETY





SOURCE: National Science Foundation

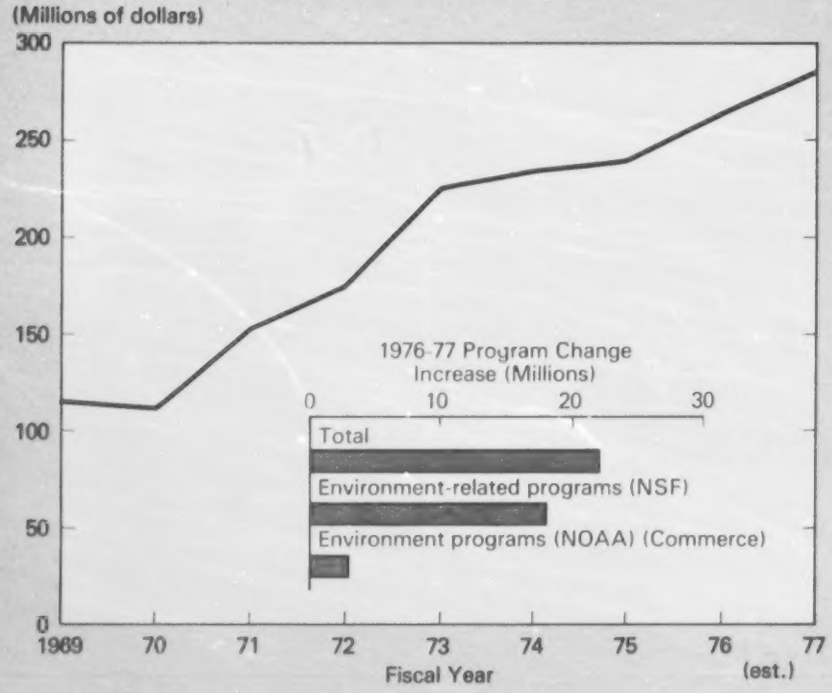
This program is devoted specifically to assuring safer working conditions for miners and to reducing health hazards in mining.

The environmental and fuel cycle research of NRC is a new program first funded in 1975. Confirmatory research is carried out on reactor safety as well as assessment of environmental and worker impact of the regulated portion of the fuel cycle process: uranium milling, fuel fabrication, reprocessing, conversion and enrichment, transportation, and waste management.

Food safety research of HEW's Food and Drug Administration (FDA) has been maintained at a stable level for several years. Research is directed to methods for detecting and quantifying contaminants in food and determining the safety of food components.

Other programs within the environmental health subfunction include human health and safety research of the Agricultural Research Service (USDA), work of the Occupational Safety and Health Administration (Labor), work of the National Fire Prevention and Control Administration (Commerce), and research efforts of the Consumer Product Safety Commission.

UNDERSTANDING, DESCRIBING, AND PREDICTING THE ENVIRONMENT



SOURCE: National Science Foundation

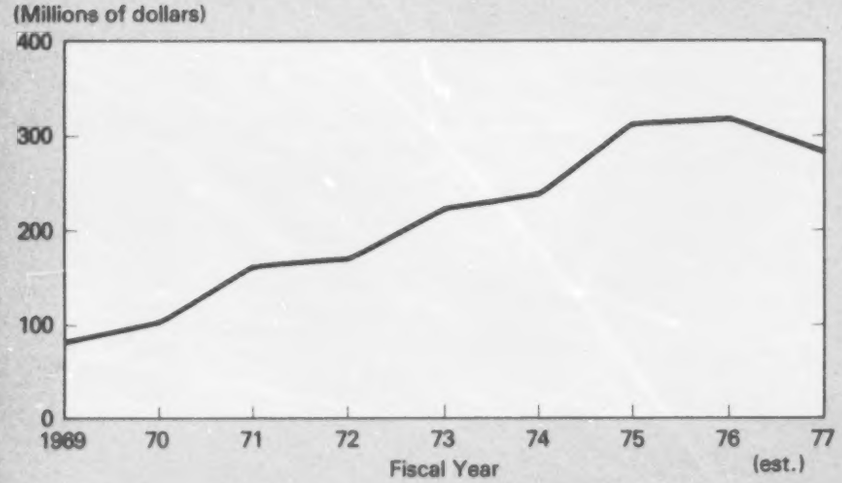
- **Understanding, describing, and predicting the environment** shows moderate growth in 1977 on an overall basis, making it the second-largest subfunction in size of funding. The R&D activities of three agencies form most of the basis for this environment subcategory. The largest group of programs is sponsored by NASA. These consist of satellite activities, the largest of which is made up of weather and climate observing and forecasting efforts, including severe storm research, and the next of which are ocean condition and earth dynamics monitoring and forecasting activities, with the ocean condition satellite effort scheduled for a sizable increase. These satellite activities include analysis of data from the GEOS-3 mission and development of the SEASAT-A satellite. Efforts toward a future earthquake prediction capability will include some ground-based experiments.

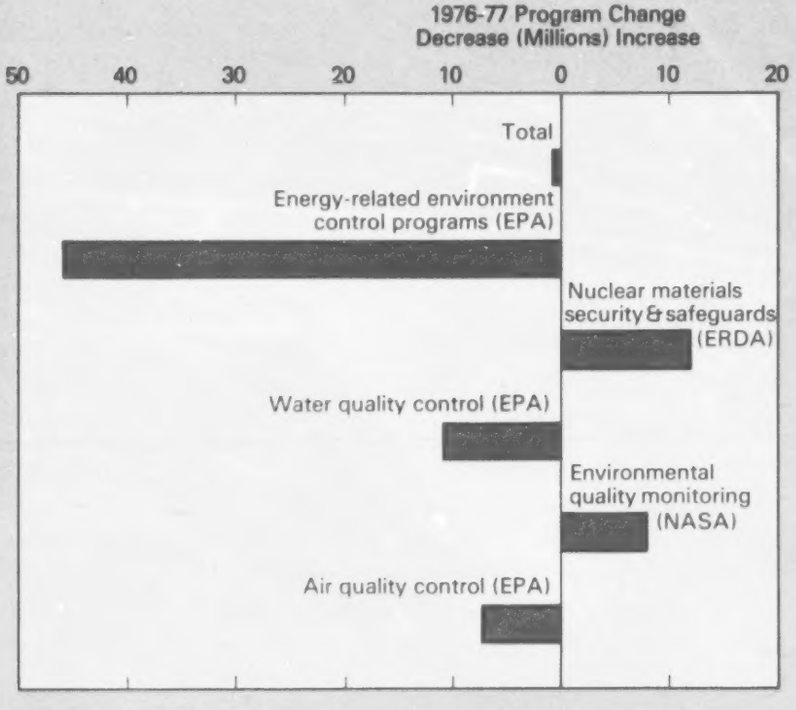
NSF currently sponsors a group of 10 environment-centered research programs, of which the largest is the U.S. Antarctic Research Program, scheduled for a 45-percent increase in 1977. Others involve earthquake engineering, weather modification, and social response to natural hazards—all within the broader Research Applied to National Needs (RANN) program. They also include NSF support to several international environmental study efforts, such as the Global Atmospheric Research Program (GARP) and the environmental forecasting program of the International Decade of Ocean Exploration (IDOE) as well as support to the interagency Arctic Research Program.

The National Oceanic and Atmospheric Administration (NOAA) supports a group of eight programs under the broad environment heading. These include basic environmental services, public forecasting and warning, weather modification, and mapping, charting and surveying services. These programs show moderate change, or no change, in 1977.

Other NOAA activities cover marine ecosystems investigations, environmental satellite services, and support to international projects.

POLLUTION CONTROL AND ENVIRONMENTAL PROTECTION





SOURCE: National Science Foundation

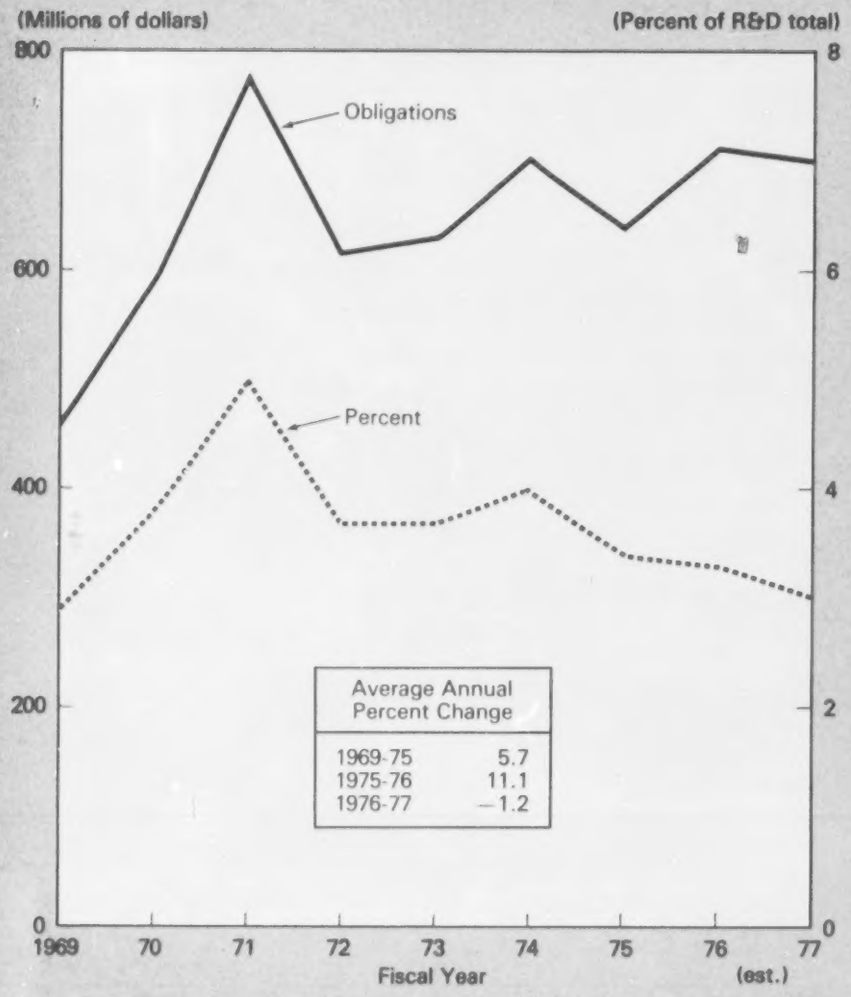
- The subfunction of **pollution control and environmental protection** reflects an 11-percent decrease in 1977, almost entirely the result of lower support to three EPA programs—energy-related environmental control, water quality control, and air quality control. These are part of a group of nine EPA-sponsored research and quality control programs, including, besides the first three, interdisciplinary studies, solid waste, pesticides, and radiation.

NASA's environmental quality monitoring reflects a planned increase of 26 percent in 1977. Work continues on the Nimbus-G, an experimental air pollution monitoring satellite, scheduled for launch in 1978, and on the Stratospheric Aerosol and Gas Experiment Mission, designed to measure atmospheric constituents.

ERDA nuclear materials security and safeguards development is scheduled almost to double between 1976 and 1977. This program is directed toward designing safeguards systems using physical protection and materials control and accountability elements and testing them in plant environments.

Other pollution control and environmental protection programs include ERDA's environmental control technology, air and noise pollution studies of the Federal Aviation Administration (DOT), control of pollution from spillage and waste by the Coast Guard (DOT), operational safety work by ERDA, several NSF-sponsored programs, and a few others of DOT and DOD.

TRANSPORTATION AND COMMUNICATIONS FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

TRANSPORTATION AND COMMUNICATIONS

- Funding for transportation and communications R&D programs has remained at about the same level since 1974, with a moderate drop in 1975. The decrease in 1977 amounts to only 1 percent.

- As a share of the Federal R&D total the transportation and communications function has moved from 2.9 percent in 1969 to a high of 5.0 percent in 1971 before termination of the SST program, and is an estimated 3.0 percent in 1977.

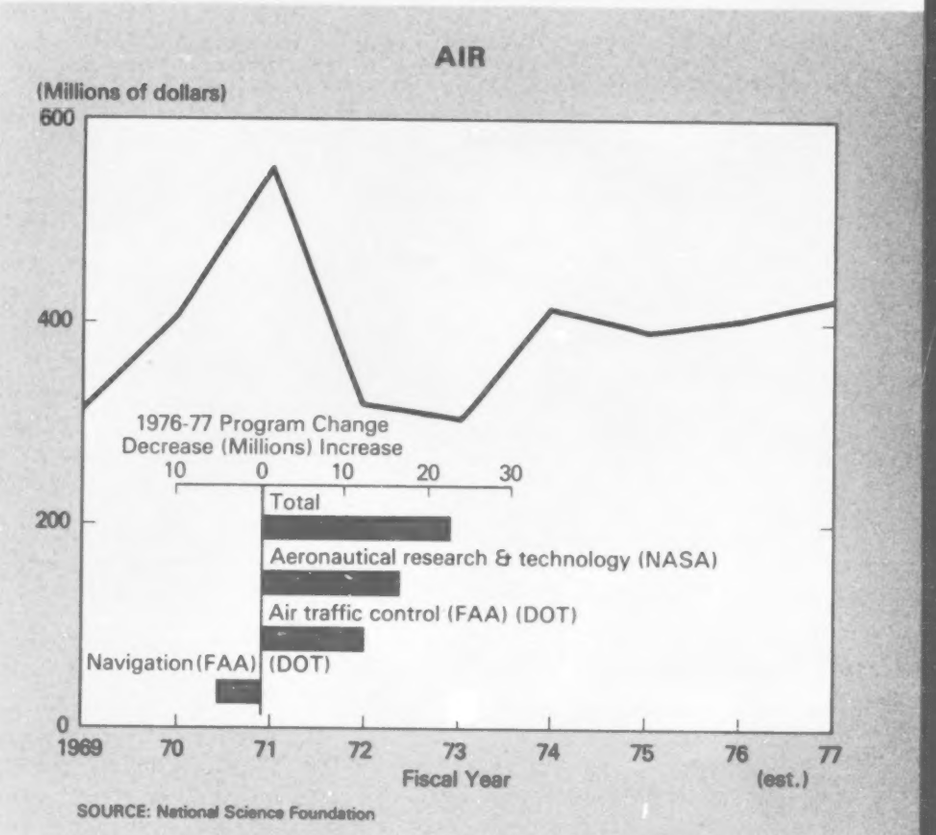
- Despite some wide year-to-year fluctuations, the average annual growth rate in funding for this function is 5.5 percent between 1969 and 1977, about equal to the average of all Federal R&D programs.

	1969	1975	1976	1977
	[Dollars in millions]			
Transportation and communications, total	$458.1	$640.5	$711.3	$702.5
	Percent distribution			
Air	68.9%	61.7%	56.9%	60.9%
Aeronautical research and technology (NASA)	38.9	46.9	44.3	47.2
Air traffic control (FAA) (DOT)	5.7	6.2	5.9	7.7
Other air transportation R&D (FAA) (DOT)	2.9	5.7	3.5	3.4
Navigation (FAA) (DOT)	.9	2.9	3.2	2.5
Civil Aeronautics Board	(1)	.1	.1	.1
Civil supersonic aircraft (DOT)	20.5	—	—	—
Ground	15.3	24.5	30.7	27.3
Urban Mass Transportation Administration (DOT)	4.0	7.4	7.6	9.6
Railroad research (FRA) (DOT)	(1)	5.1	9.6	6.1
High Speed ground transportation R&D (FRA) (DOT)	2.5			
National Highway Traffic Safety Administration (DOT)	2.4	5.3	6.9	6.0
Federal Highway Administration (DOT)	6.4	6.8	6.5	5.6
Water	5.4	5.2	4.5	4.5
Maritime Administration (Commerce)	1.8	3.6	3.0	2.8
Coast Guard (DOT)	3.6	1.6	1.5	1.8
Multimodal	.9	3.2	3.8	3.1
Office of the Secretary (DOT)	.9	3.2	3.8	3.1
Communications	9.4	5.4	4.1	4.1
Communications satellite program (NASA)	9.2	3.2	2.1	2.2
Other	.2	2.2	2.0	2.0

(1) Less than 0.05 percent.

SOURCE: National Science Foundation.

- Throughout the 1969-77 period the **air** subfunction has been the most heavily funded area, accounting for three-fifths of the transportation and communications total in 1977. Within the air subfunction, the major activity is NASA's aeronautical research and technology program, which makes up almost one-half of the function total in 1977.



SOURCE: National Science Foundation

This NASA program is scheduled for a 5-percent rise in 1977. It will continue to address specific areas of concern to both civil and military aircraft. These include improved performance, reduced energy requirements, enhanced operating economy, reduced environmental effects such as noise and pollution, improved safety aid reliability, and reduced terminal area congestion. Emphasis will be placed on aircraft energy efficiency technologies.

The next most heavily supported programs under air transportation are three of the Federal Aviation Administration (FAA) within DOT. Work in air traffic control, the largest, is involved with many facets of air traffic management, including computerized data processing for traffic controllers and development of systems designed to increase the capacity of major airports to handle larger, faster passenger aircraft safely and efficiently. Another important FAA area covers efforts to improve the accuracy of navigation aids. The remaining FAA program efforts are concerned with aircraft safety and operations.

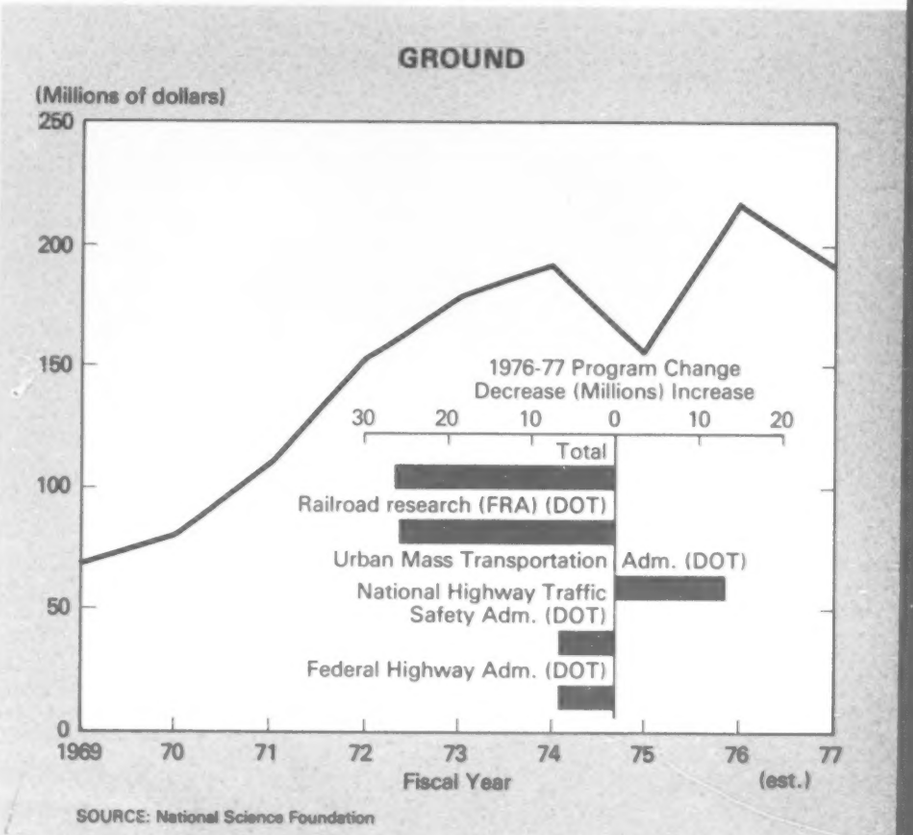
- **Ground** transportation R&D programs currently account for slightly more than one-fourth of the transportation and communications total. In 1977 support to this area is expected to drop 12 percent as decreases in several DOT programs—the Federal Highway Administration (FHA), Federal Railroad Administration (FRA) and National Highway Traffic Safety Administration (NHTSA)—more than offset increases scheduled for the DOT Urban Mass Transportation Administration (UMTA).

The UMTA program is scheduled to rise 24 percent in 1977. Emphasis is currently placed on needed technology improvements for bus and rail vehicles as well as the development of critical component technologies for advanced automated guideway transit systems. In 1977 prototype development of the advanced group rapid transit (GRT) system will be started, and work on the advanced concept train (ACT) will continue. The major initiative will be preparatory work toward demonstration of a shuttle and loop transit (SLT) system in an urban setting.

R&D efforts of FRA are expected to receive 38 percent less support in 1977, primarily because of unusually high funding in 1976 resulting from a prior-year carryover. Railroad R&D programs involve rail freight service research and development, including track technology classification yards, and the technology portion of the intermodal freight system demonstration program; passenger service research and development; and other activites, such as propulsion research and a new energy/electrification program.

A 14-percent decrease in the R&D programs of NHTSA is expected in 1977. Most of this reduction stems from completion of the alcohol safety action program. NHTSA activities involve motor vehicle and highway safety research and development, including improvement of the accident investigation data and research on vehicle safety.

FHA also is scheduled for a drop in R&D support in 1977—15 percent. FHA maintains a balanced program of research and development in the planning, design, construction, and maintenance of highways and highway systems and in highway and motor carrier safety. Most R&D funds are transferred to States and localities since planning and research by these recipient bodies are a condition of the receipt of highway grants.



SOURCE: National Science Foundation

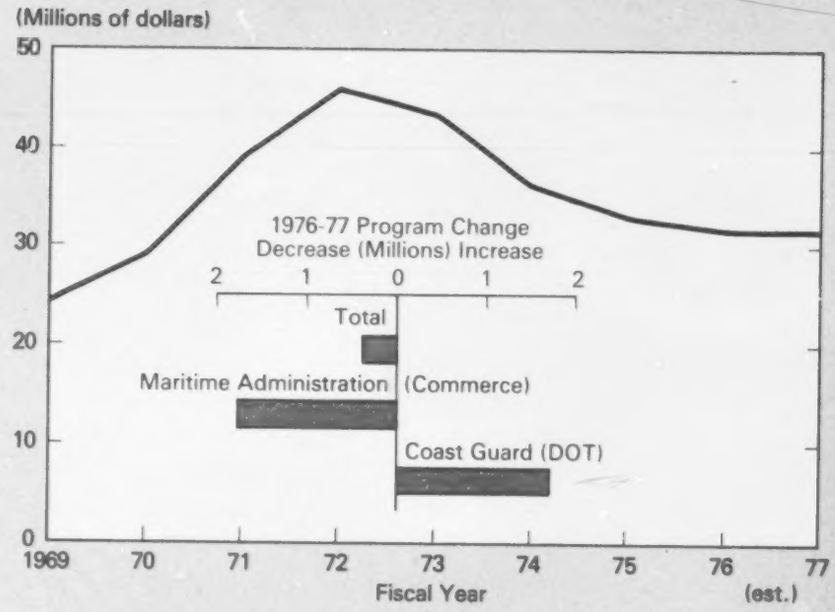
- R&D funding under the **water** subfunction remains at about the same level in the current (1975-77) period—sometimes less than the amounts spent from 1972 to 1974.

  The Maritime Administration (Commerce) is the chief source of water transportation R&D support. In 1977 major efforts are focused on improving the productivity of U.S. shipyards and ship machinery, on improving ship operations through management control and automation, on conducting maritime research, and on developing advanced technology concepts.

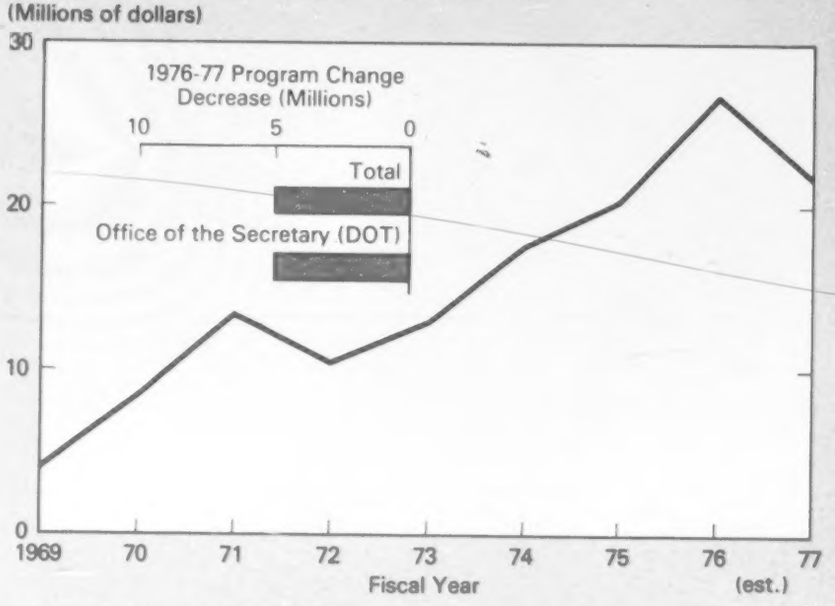
  The Coast Guard (CG) (DOT) is the only other agency classified under the water subcategory. CG programs are designed to improve search and rescue operation effectiveness, to improve the accuracy of navigational aids, and to provide a base for development of regulations to prevent vessel casualties.

- The **multimodal** subfunction is entirely represented by one program, that of the Office of the Secretary, DOT. This office sponsors research for development of overall transportation policy and planning at the national level, university research to assure that higher education resources are brought to bear on transportation problems, projects to complement R&D programs of DOT operating administrations and to stimulate industry efforts in transportation technology, and technical studies in special program areas.

WATER



MULTIMODAL

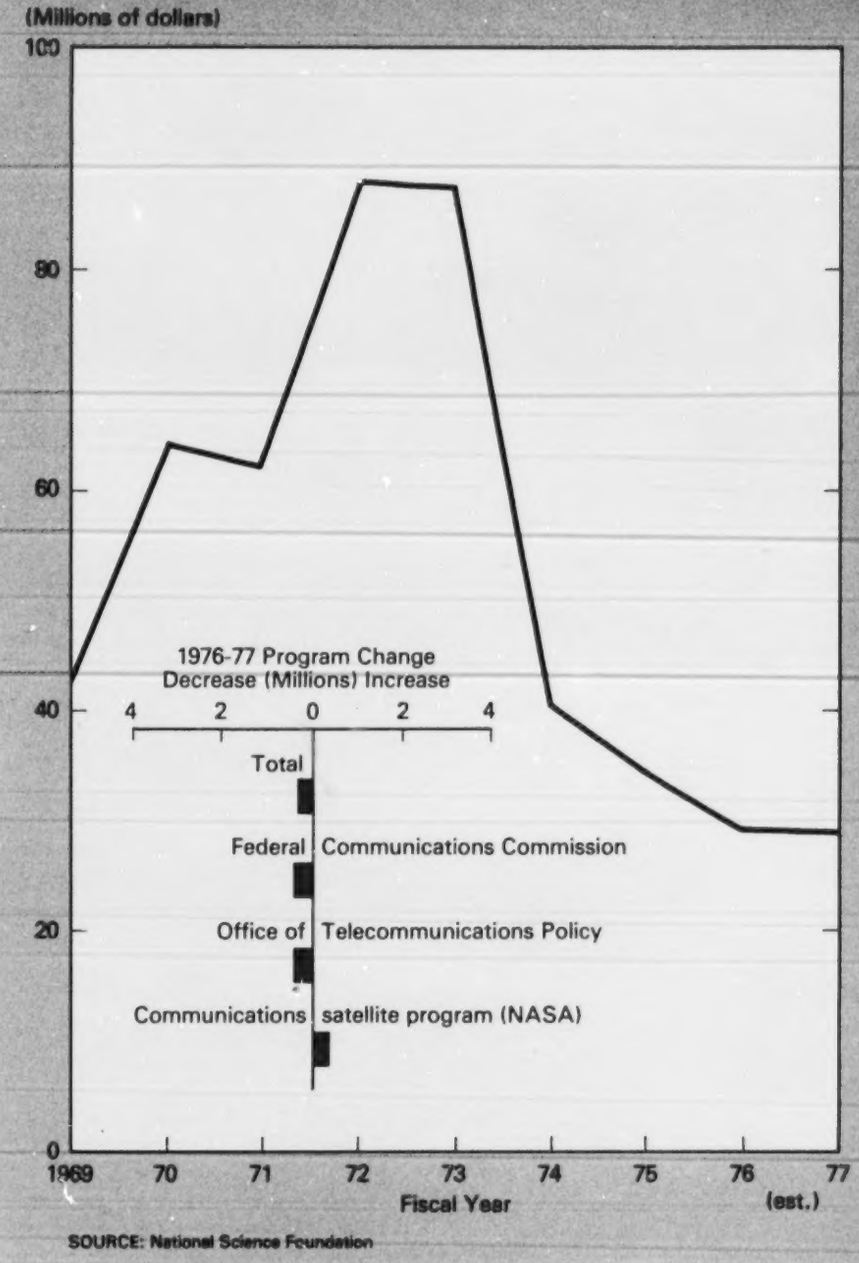


SOURCE: National Science Foundation

- Support for the **communications** subcategory appears to be leveling off in 1977 following a 67-percent funding decline between 1972 and 1976. In 1977 this subcategory accounts for 4 percent of the total transportation and communications effort compared with 9 percent in 1969.

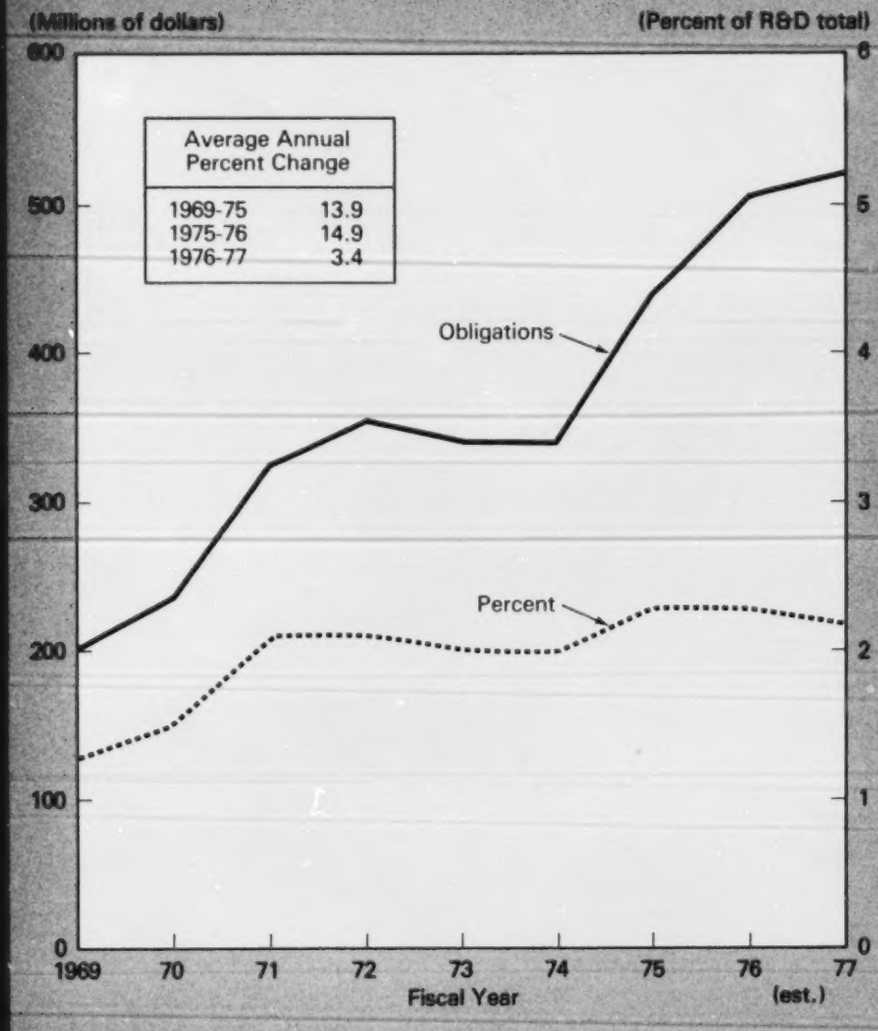
  The NASA communications satellite program made up almost all of the communications subfunction until the current (1975-77) period. Recently NASA phased down this program with the expectation that industry would take responsibility for future developments in this field. The Applications Technology Satellite (ATS-6) completed its first year of operations in May 1975. After experiments in India the satellite was returned to the Western Hemisphere in mid-1976 to resume experimental programs here, along with the Cooperative Applications Satellite (United States/Canadian), launched in early 1976.

COMMUNICATIONS



SOURCE: National Science Foundation

NATURAL RESOURCES
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

NATURAL RESOURCES

- In 1977 even though the natural resources function is expected to reach the highest level of funding in any year since 1969, little growth is shown over 1976.

- The average annual growth rate of 12.7 between 1969 and 1977, however, is almost two and one-half times that of overall Federal R&D programs.

- The natural resources share of the Federal R&D total is expected to be 2.2 percent in 1977 compared with 1.3 percent in 1969.

	1969	1975	1976	1977
	[Dollars in millions]			
Natural resources, total	$201.0	$438.8	$504.4	$521.4
	Percent distribution			
Mineral	20.9%	33.4%	36.9%	32.7%
Mining research (Bureau of Mines) (Interior)	3.7	11.5	14.7	13.7
Geologic and mineral resources surveys (GS) (Interior)	9.8	16.0	14.2	12.7
Metallurgy research (Bureau of Mines) (Interior)	5.6	4.1	5.7	4.1
Other	1.8	1.9	2.3	2.2
Water	32.3	14.5	13.0	13.0
Saline water R&D (OWRT) (Interior)	11.0			
Water resources research (OWRT) (Interior)	5.3	4.4	4.1	4.3
Water resources investigations (GS) (Interior)	5.7	4.2	3.8	3.8
Bureau of Reclamation (Interior)	3.6	1.8	1.7	1.5
Watershed management research (FS) (USDA)	1.9	2.0	1.5	1.5
Water related programs (Civil Functions) (DOD)	4.6	2.1	1.9	1.9
Other	.2	—	—	—
Land	12.1	13.5	12.2	12.7
Forest insect and disease research (FS) (USDA)	3.1	3.9	3.7	3.7
Timber management research (FS) (USDA)	4.5	3.6	3.1	3.1
Land information and analysis (GS) (Interior)	.5	2.2	1.9	2.0
Cooperative forestry research (CSRS) (USDA)	1.7	1.6	1.5	1.4
Forest resource evaluation (FS) (USDA)	1.2	.9	1.1	1.4
Other	1.2	1.2	.9	1.1
Recreation	12.7	8.1	7.6	7.6
Wildlife resources (FWS) (Interior)	5.7	2.2	2.0	2.0
Fishery resources (FWS) (Interior)		1.5	1.4	1.4
Habitat preservation (FWS) (Interior)		.9	.8	.8
National Park Service (Interior)	1.3	1.9	1.8	1.8
Wildlife, range and fish habitat research (FS) (USDA)	1.4	1.1	1.1	1.1
Other	4.4	.4	.4	.4
Multiresource	22.0	30.5	30.3	34.0
Earth resources detection and monitoring (NASA)	9.5	19.2	17.2	19.0
Research on use and improvement of soil, water, and air (ARS) (USDA)	10.1	5.9	6.1	6.4
Sea Grant program (NOAA) (Commerce)	2.0	3.5	3.5	3.4
Applications explorer missions (NASA)	—	.8	1.7	3.3
Other	.4	1.0	1.9	2.0

SOURCE: National Science Foundation

Comments

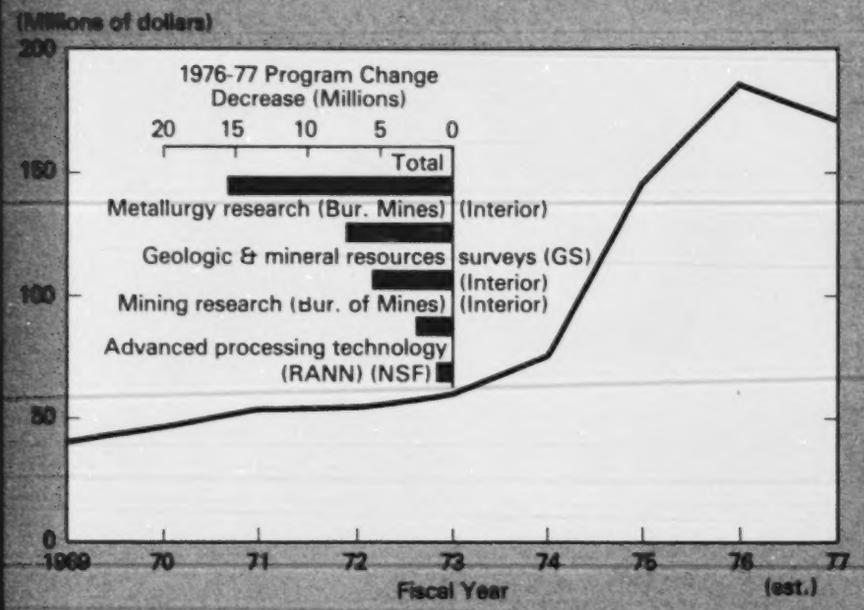
- The **mineral** subfunction, which became the leading natural resources program area in 1975, is expected to show a decline of 8 percent in 1977. This decrease is the first in the 1969-77 period. Several programs of the Bureau of Mines (Interior) and one of the Geological Survey (Interior), which received large increases in preceding years, will account for most of this decrease.

The mining research program of the Bureau of Mines, the largest within the mineral subfunction, is scheduled for a 4-percent reduction in 1977. This program covers research designed to increase mining efficiency, bring marginal deposits into production, maximize recovery, and minimize pollution. The 1977 effort provides for continuing emphasis on coal extraction and preparation technology to support an increasing use of coal for energy.

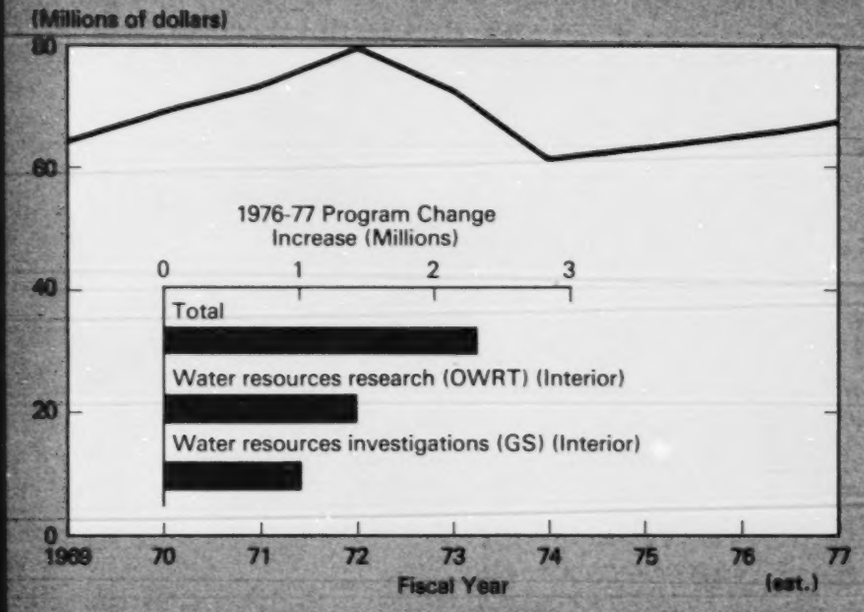
The geologic and mineral resources surveys sponsored by the Geological Survey (GS) are scheduled for an 8-percent decrease in 1977. This program doubled in size in 1975 in response to needs of the national energy program, and that level was maintained in 1976. Program decreases are now planned for geothermal investigations, offshore geological surveys, and general geological research, while increased attention will be focused on assessment of geologic hazards in nuclear reactor siting, on coal environmental studies, on assessment of coal and uranium/thorium energy resources, and on Alaska mineral resource appraisal.

The metallurgy research program of the Bureau of Mines is another that has grown significantly in preceding years but will show a decrease in 1977—in this case, 26 percent. Research is carried out on extraction, recovery, purification, fabrication, and recycling processes for metallic and nonmetallic minerals. The decrease in 1977 is from reduced requirements for the design and construction of pilot

MINERAL



WATER



SOURCE: National Science Foundation

plants (considered as research projects in themselves). This program will focus on advanced metallurgy technology, abatement of pollution from metallurgical processes, management of mineral waste and improvement of mineral materials.

Other programs include GS conservation of lands and minerals research, NSF support to the seabed assessment program of IDOE, and two other NSF programs within the larger RANN program: mineral market behavior and advanced processing technology, both funded at relatively low levels.

- The **water** subfunction is scheduled for only a slight increase in 1977. Funding in this area has changed very little in the 1969-77 period.

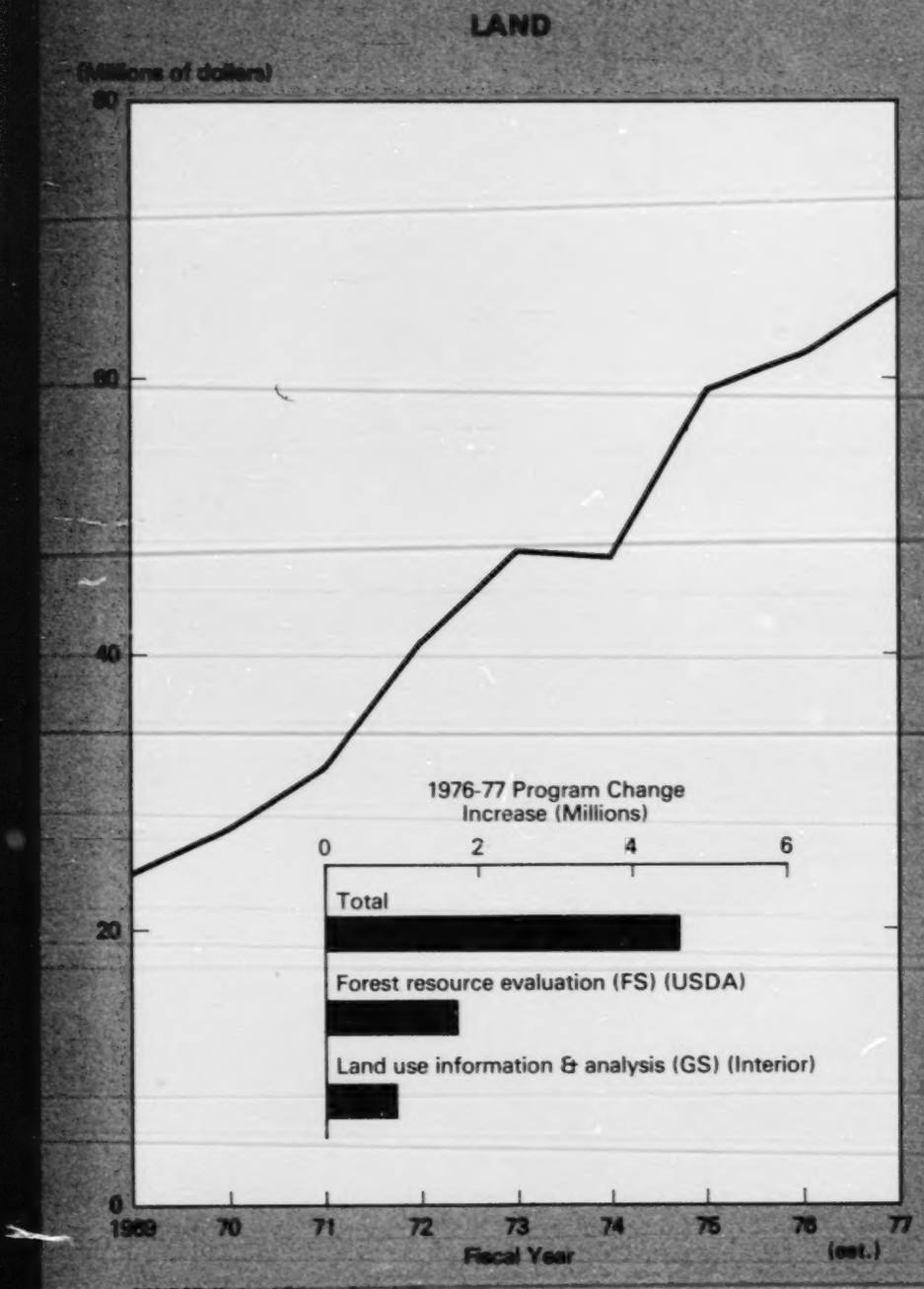
The leading program, sponsored by Interior's Office of Water Research and Technology (OWRT), is water resources research, scheduled for a 7-percent increase in 1977. This program covers annual grants to university-based water resources research institutes in the 50 States. It also includes support to development of technology for saline water conversion and other water technology.

Next in size is the Geological Survey water resources investigations program, which has shown gradual growth since 1969 and reflects a 6-percent increase in 1977. The purpose of this program is to provide reliable, adequate, and timely water data as a basis for national water use, development and planning. Funding for a number of ongoing programs is to be reduced or deferred while energy-related activities in coal hydrology, oil shale hydrology, and nuclear energy hydrology will be expanded.

The R&D efforts of the Bureau of Reclamation (Interior), are devoted to research on atmospheric water resources management, water resources planning and engineering, and energy research and development with emphasis on geothermal and pumped storage resources.

The USDA Forest Service watershed management research program is concerned with problems of pollution of soil and water, with techniques for increasing streamflow, and with methods for stabilizing soil.

Four programs conducted by the DOD Corps of Engineers (Civil Functions) are water-related. These are coastal engineering R&D studies, flood control and navigation, materials research, and water resources planning studies.



SOURCE: National Science Foundation

- The **land** subfunction has nearly tripled in the 1969-77 period, and growth in 1977 is 7 percent above the 1976 level.

  The chief impetus to growth has come from two Forest Service programs. The largest is forest insect and disease research, which has more than tripled in support since 1969. The program concern is to define, measure, and evaluate the ecological and socioeconomic impacts of destructive insects and disease on all forest resource uses and values, and on wood in storage and use; to detect and predict changes in the occurrence of these pests, and to reduce and/or maintain their numbers and impacts.

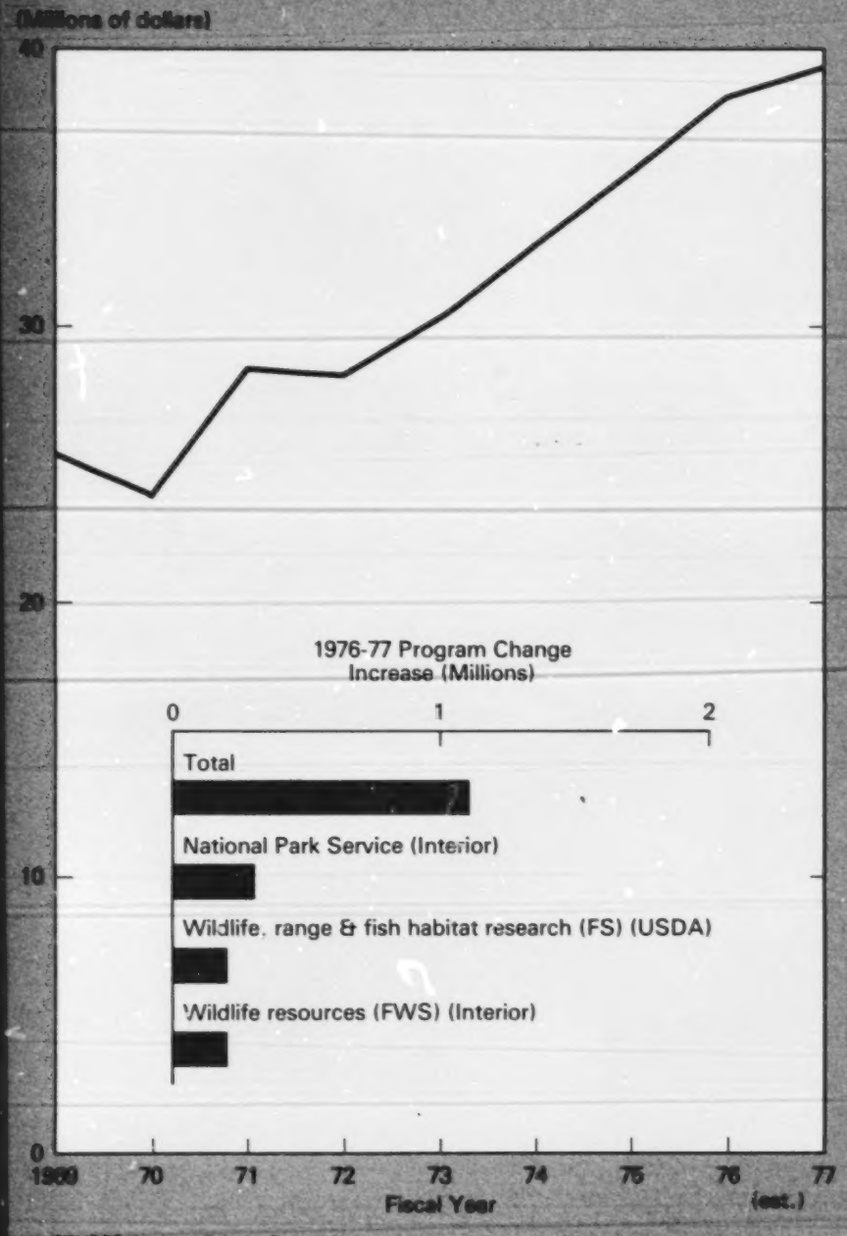
  The Forest Service timber management research program has almost doubled in funding since 1969. This program is concerned with genetic improvements of forest trees, methods of intensive culture, and soil improvement.

  The Geological Survey land information and analysis program is scheduled for a 9-percent increase in 1977 attributable to increased responsibility under the National Environmental Policy Act (NEPA). Activities include development and application of technology to support land-use decisionmaking, mapping of current land use, and collection and distribution of remote sensing data to aid in the program.

  The USDA Cooperative State Research Service (CSRS) cooperative forestry research program is not expected to change in funding in 1977. Under this program funds are allocated to land-grant colleges or agricultural experiment stations in the 50 States on a matching basis to cover research on the production and management of forest resources.

  Two other programs of the Forest Service are expected to expand in 1977. The forest resource evaluation program, planned for growth of 31 percent, provides basic statistics on forest land and on quantity and quality of growing timber through a periodic inventory of the Nation's forests. The surface environment and mining program, expected to grow by 4 percent in 1977, is designed to provide an innovative array of reclamation alternatives.

RECREATION



SOURCE: National Science Foundation

- The **recreation** subfunction is scheduled to increase only nominally in 1977. Three programs of Interior's Fish and Wildlife Service (FWS) will account for more than one-half of the subfunction total.

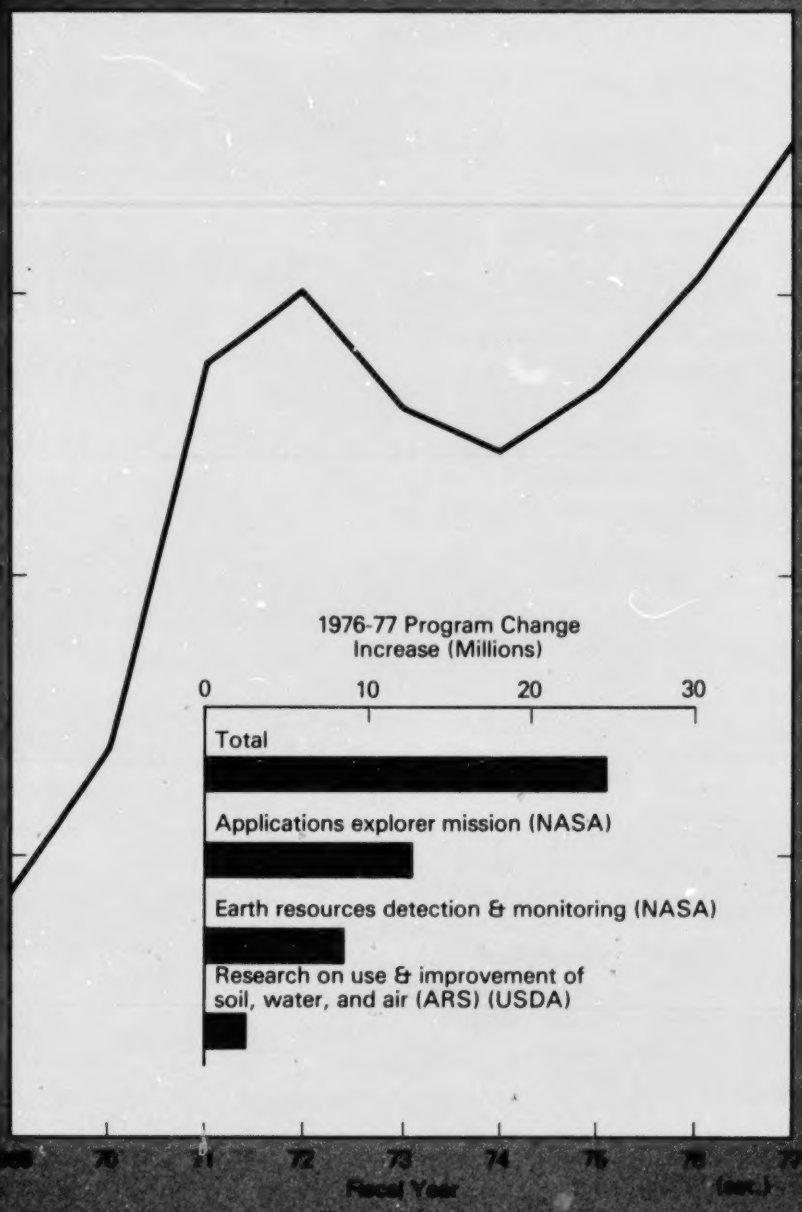
  The largest program, wildlife resources research, covers habitat, population management, and life history of waterfowl and other migratory birds. It emphasizes animal damage control and protection of endangered species.

  The FWS fishery resources program is designed to promote distribution and abundance of sport fish in the natural environment. It includes programs on coastal anadromous, Great Lakes, and inland and reservoir fish.

  The FWS habitat preservation program is aimed at improving the quality and availability of fish and wildlife habitat through environmental contaminant evaluation, land and water resources development planning, and biological services.

  The National Park Service research program shows much growth since 1974, largely the result of a better reporting system. The program includes research on park management as well as administration of the Archaeological Investigations Program to recover archaeological and historic data and remains which are threatened by Federal programs.

  Forest Service wildlife, range, and fish habitat research seeks to improve the quality of most of the Nation's terrestrial environment in terms of wildlife and livestock and their use by man. A special effort is made to define habitat requirements for rare, endangered, and unique wildlife species.



- The **multiresource** subfunction will grow by an estimated 16 percent in 1977, almost entirely because of increased funding for one program—NASA's Earth resources detection and monitoring. This program is the largest single program within the natural resources function, making up almost one-fifth of the total in 1977. A 14-percent increase in 1977 will serve to continue operation of Earth resources technology satellites, helping to determine more precisely the full range of applications that could be achieved with remote sensing systems in Earth orbit. Current demonstration projects include the Large Area Crop Inventory Experiment, water resources management, eastern surface mine monitoring, and land management.

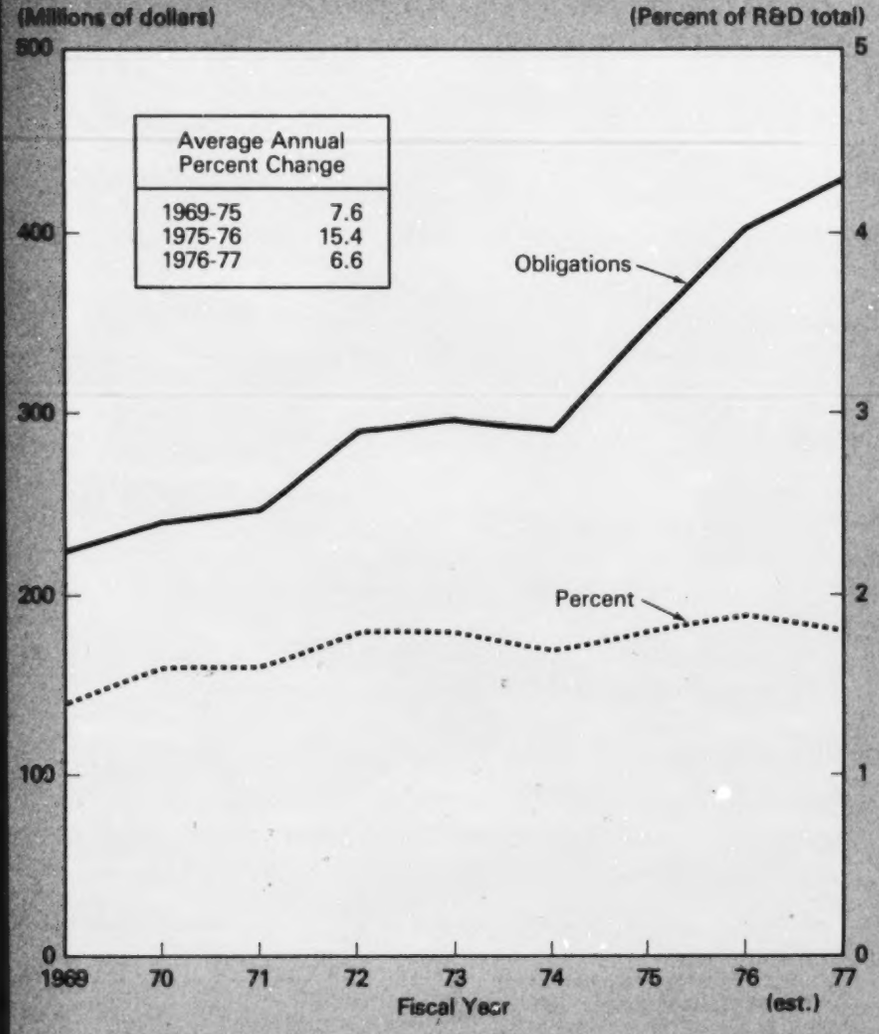
  ARS research on use and improvement of soil, water, and air is expected to increase by 9 percent in 1977. This program covers research on soil and water management, including the study of hydrologic problems of agricultural watersheds and work on agricultural pollution problems.

  The NOAA sea grant program reflects no change in funding. Under this activity, matching grants are made to public and private organizations to seek solutions to problems in management and use of marine resources and in technology transfer.

  NASA's applications explorer mission is expected to double in size in 1977, having grown more than four times since its inception in 1975. This program includes the Heat Capacity Mapping Mission to produce thermal maps of the continental United States, differentiating rock types for probable location of mineral resources. The thematic mapper, a multispectral sensor, is scheduled for development in 1977. The Magnetic Field Satellite (MAGSAT), used to update maps of the Earth's magnetic field, is also part of this program.

  Other programs within this subfunction include several NSF programs, such as living resources within IDOE and resource systems and resource conservation within RANN, as well as GS topographic surveys and mapping.

FOOD, FIBER, AND OTHER AGRICULTURAL PRODUCTS FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

FOOD, FIBER, AND OTHER AGRICULTURAL PRODUCTS

- The food, fiber, and other agricultural products function has almost doubled in support in the period under study, with greatest growth taking place in 1975 and 1976. The increase from 1975 to 1976 is 15 percent, but from 1976 to 1977, only 7 percent.

- The average annual growth rate of this function in the 1969-77 period is 8.4 percent, more than one and one-half times the growth rate for overall Federal R&D obligations.

- The share of food, fiber, and other agricultural products is an estimated 1.8 percent of the Federal R&D total in 1977 compared with 1.4 percent in 1969.

	1969	1975	1976	1977
	[Dollars in millions]			
Food, fiber, and other agricultural products, total	$225.0	$348.5	$402.2	$428.6
	Percent distribution			
Production	76.2%	79.3%	79.7%	81.1%
Agricultural research under the Hatch Act (CSRS) (USDA)	22.9	22.2	21.3	23.1
Research on plant production (ARS) (USDA)	33.1	22.2	22.8	22.9
Research on animal production (ARS) (USDA)		11.8	12.2	11.8
Food and nutrition research (ARS) (USDA)		2.2	2.7	2.6
Ocean fisheries and living marine resources (NOAA) (Commerce)	14.2	12.5	11.8	12.1
Agricultural research under the Morrill Act (CSRS) (USDA)	1.5	4.4	4.9	3.7
Other	4.6	4.1	4.1	4.9
Marketing and distribution	23.3	20.3	19.7	18.4
Marketing efficiency (ARS) (USDA)	17.1	13.2	12.7	11.7
Expansion of agricultural exports (ARS) (USDA)		.5	.5	.5
Consumer services (ARS) (USDA)		.1	.1	.1
Economic Research Service (USDA)	5.9	6.1	6.1	5.8
Farmer Cooperative Service (USDA)	.4	.3	.3	.3
Other	.4	.3	.5	.5

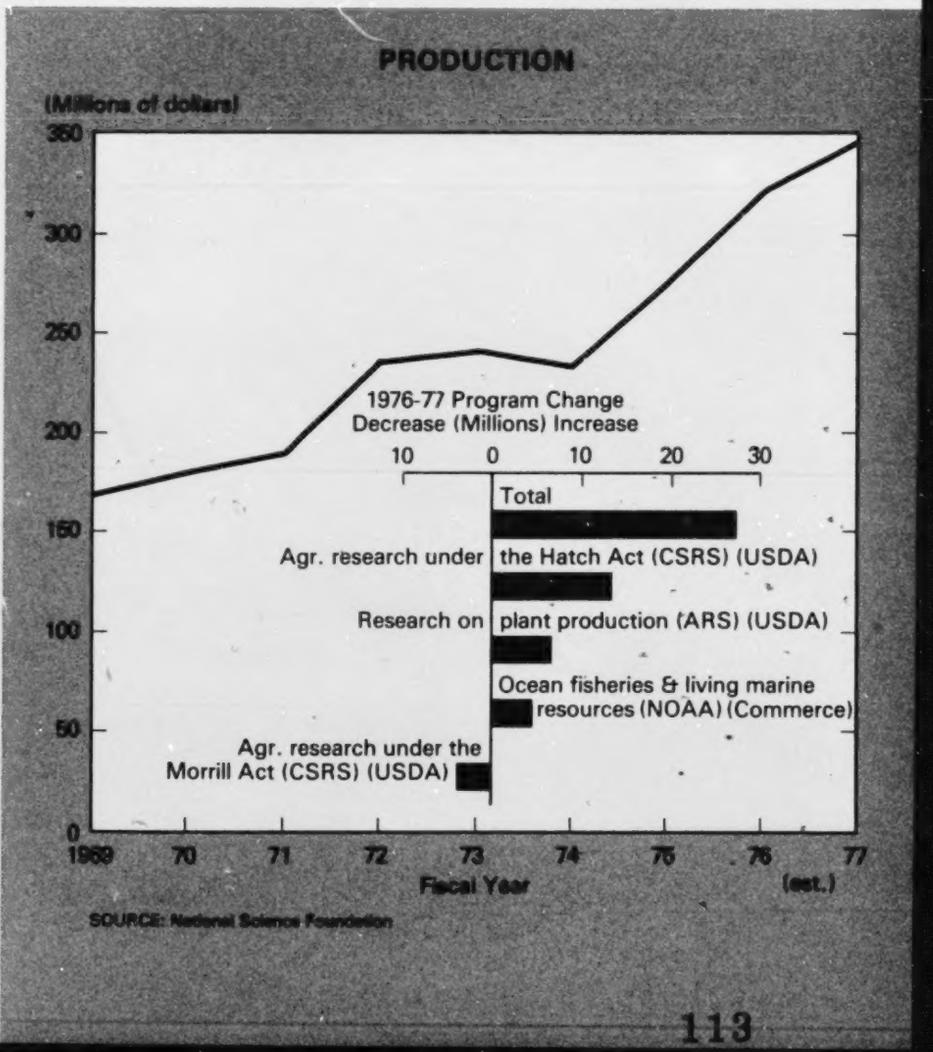
SOURCE: National Science Foundation

Comments

- **Production** has been the largest subfunction throughout the 1969-77 period and has had the greatest influence on trends for the overall function. Funding has approximately doubled since 1969 but is scheduled to increase by only 8 percent in 1977. Almost all programs within this subfunction are expected to reflect an increase in the 1977 budget year.

  In 1977 agricultural research sponsored by the USDA Cooperative State Research Service (CSRS) under the Hatch Act is expected to account for almost one-fourth of the overall function total.[12] An increase of 15 percent is scheduled. Funding is provided in the form of grants to agricultural experiment stations of land-grant colleges throughout the United States. The objective of this program is the development of natural resources essential to agricultural productivity and to the maintenance of an effective agricultural industry. The increase in 1977 provides for new fundamental research aimed at increasing production efficiency.

[12] The Cooperative State Research Service respondents were unable to disaggregate this program into various categories of activity, as the USDA Agricultural Research Service (ARS) respondents were able to do. If the six ARS programs shown in the table are added together, the total for ARS is far greater than that for CSRS.



Research on plant production of the USDA Agricultural Research Service (ARS) is the second largest program, and it is expected to increase by 7 percent in 1977. Program activities include research to improve plant productivity through improved varieties of food, feed, fiber, and other plants, to develop new crop resources, and to improve crop production practices. The 1977 increase will be directed to fundamental research to improve crop production.

The ocean fisheries and living marine resources program of NOAA is scheduled for a 9-percent increase in 1977. Program emphasis is on ensuring the continued availability of safe fishery products to the consumer and on conservation of endangered species. The increase will provide for expansion of marine resource monitoring, marine mammals protection, and expansion of data on recreational fishing.

ARS research on animal production is scheduled to increase slightly in 1977. The effort is directed to increasing livestock productivity through improved breeding, feeding, and management practices, and to developing methods for controlling diseases, parasites, and insect pests that affect livestock.

The ARS food and nutrition program is scheduled to increase slightly in 1977. Research is conducted on human nutritional requirements and on the composition and nutritive value of food needed for consumers as well as on projects for Federal, State, and local agencies administering food and nutrition programs.

- The **marketing and distribution** subfunction will show a decrease of less than 1 percent in 1977. Two programs, both sponsored by USDA, account for 95 percent of the subfunction total.

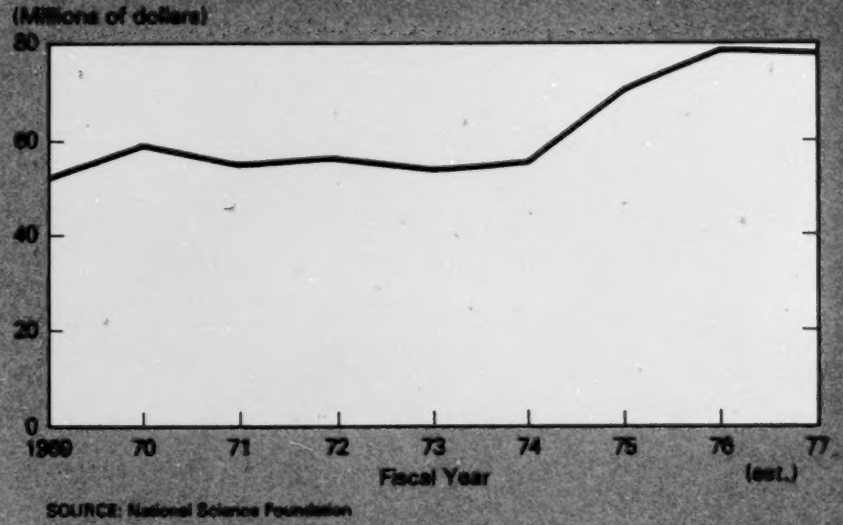
  The largest program, ARS marketing efficiency, will decrease by 2 percent in 1977. Research is scheduled to continue on the development of new and improved foods, feeds, fabrics, and industrial products and processes for domestic and foreign markets. Research on marketing is concerned with the processing, transportation, storage, wholesaling, and retailing of products to reduce costs, maintain quality, and reduce losses from waste and spoilage. The planned decrease in 1977 reflects the increased capability of industry to fund research in these areas.

The USDA Economic Research Service conducts a program that is scheduled for only a nominal increase in 1977. The total effort is directed to the economics of agricultural production, marketing, and distribution on both a national and international scale. Analyses cover marketing, prices, income, population, and product demand as well as use of resources, adjustments, costs and returns, and studies of U.S. agricultural commodities in international trade.

The remaining programs, all sponsored by USDA, include two ARS programs—expansion of agricultural exports and consumer services—as well as the research of the Farmer Cooperative Service.

- **Other** programs within the food, fiber, and other agricultural products function are the USDA Statistical Reporting Service and R&D efforts of the National Agricultural Library (USDA).

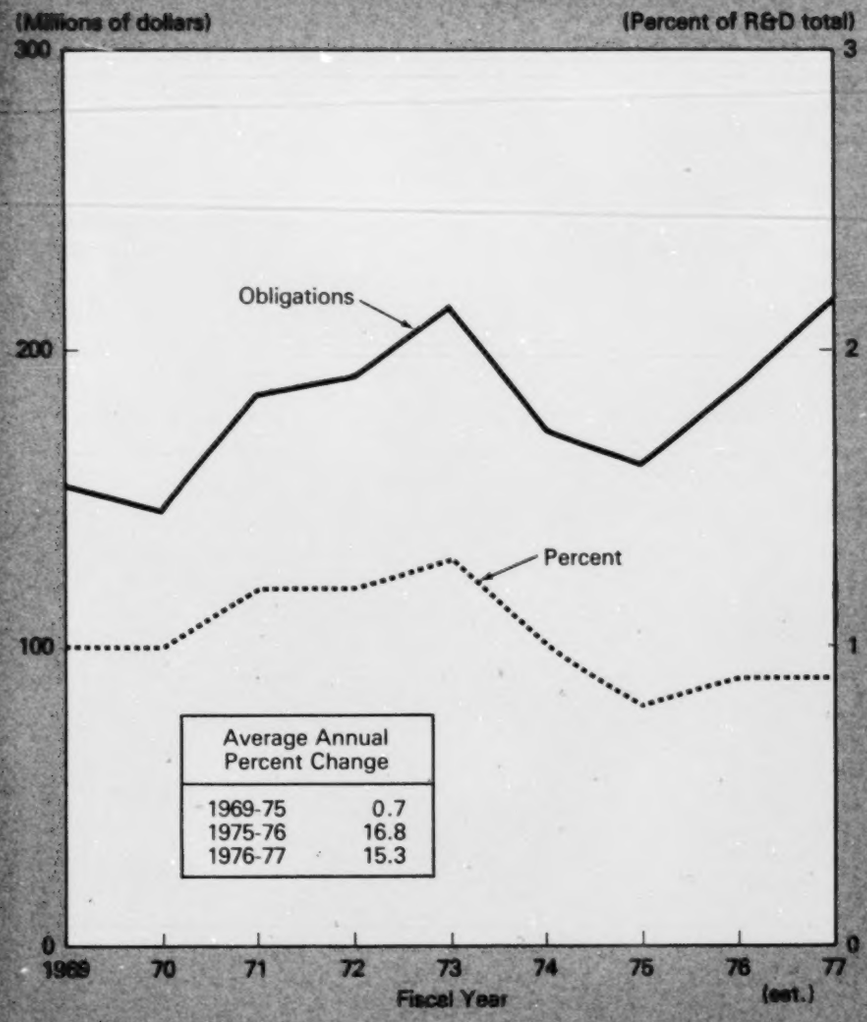
MARKETING AND DISTRIBUTION



SOURCE: National Science Foundation

47

EDUCATION
FEDERAL R&D OBLIGATIONS



Average Annual Percent Change	
1969-75	0.7
1975-76	16.8
1976-77	15.3

SOURCE: National Science Foundation

48

EDUCATION

- Funding for education R&D programs appears to be rising again following a substantial decline between 1973 and 1975. In 1976 and 1977 education R&D programs show a rise of approximately 15 percent each year.

- Despite recent gains, the education share of the Federal R&D total has not changed appreciably in the 1969-77 period—moving from 1.0 percent in 1969 to 1.3 percent in 1973, then to nine-tenths of 1 percent in 1976 and 1977.

- The average annual growth rate for education R&D programs between 1969 and 1977 is 4.3 percent.

	1969	1975	1976	1977
	[Dollars in millions]			
Education, total	$154.8	$161.2	$188.2	$217.0
	Percent distribution			
National Institute of Education (HEW)	54.3%	43.3%	37.2%	41.5%
Vocational research (OE) (HEW)	—	21.7	19.2	24.7
Research and innovation	—	9.9	9.1	--
Curriculum development	—	.6	.5	—
Research grants to States	—	11.1	9.6	24.7
Special projects: Innovative and experimental programs (OE) (HEW)	—	—	14.1	10.9
Science education development and research (NSF)	7.8	14.1	10.5	8.4
Office of the Assistant Secretary for Education (HEW)	—	7.8	7.0	6.1
Education for the handicapped (OE) (HEW)	10.0	6.0	7.8	5.1
Institutional Science Development (NSF)	15.7	—	—	—
Other	12.1	7.1	4.2	3.5

SOURCE: National Science Foundation

Comments

- The major component of the education function consists of the R&D programs of HEW's National Institute of Education (NIE). These programs are scheduled to increase 29 percent in 1977 and to account for more than two-fifths of the total Federal education effort. The major focus at present is on programs designed to improve basic skills in reading and mathematics, improve understanding of the relationship of education to work and careers, and improve the productivity of education resources.

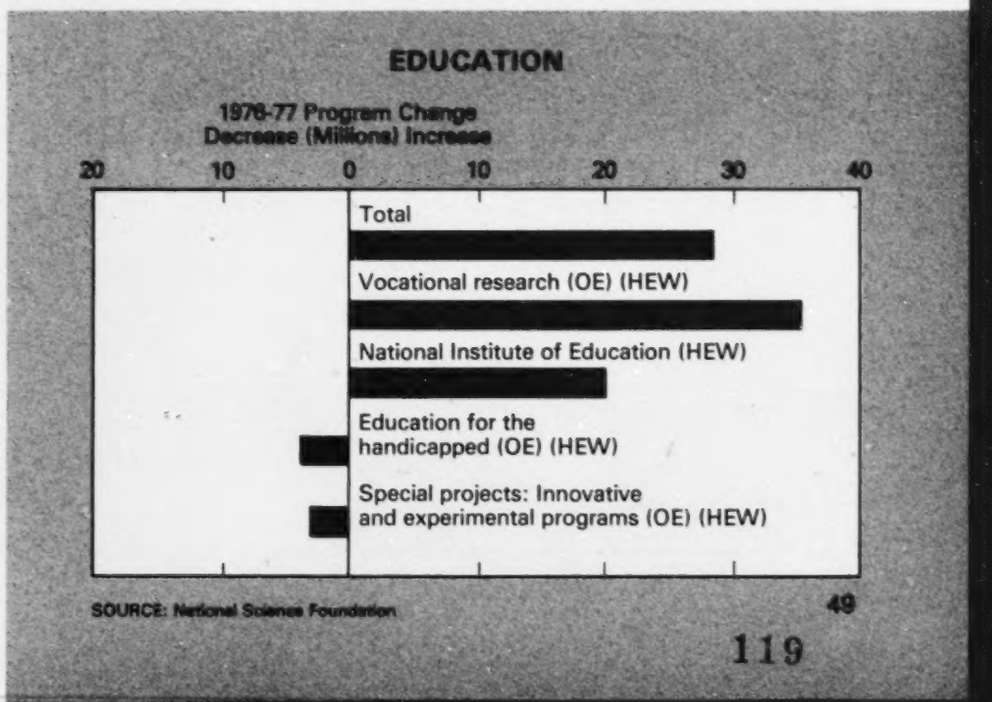
  Next in size of funding is the HEW Office of Education (OE) vocational research program. Funding for this activity is expected to increase more than any other education program—48 percent—reaching an estimated one-fourth of the education total in 1977. Under this program, grants are made to States, universities, colleges, and other institutions to support vocational R&D programs.

A group of OE special projects, involves experiments with new methods, techniques, and practices in support of metric education, work with gifted and talented children, community schools, consumer education, career education, educational television programming, and women's educational equity. A 11-percent drop in funding for these projects is scheduled for 1977.

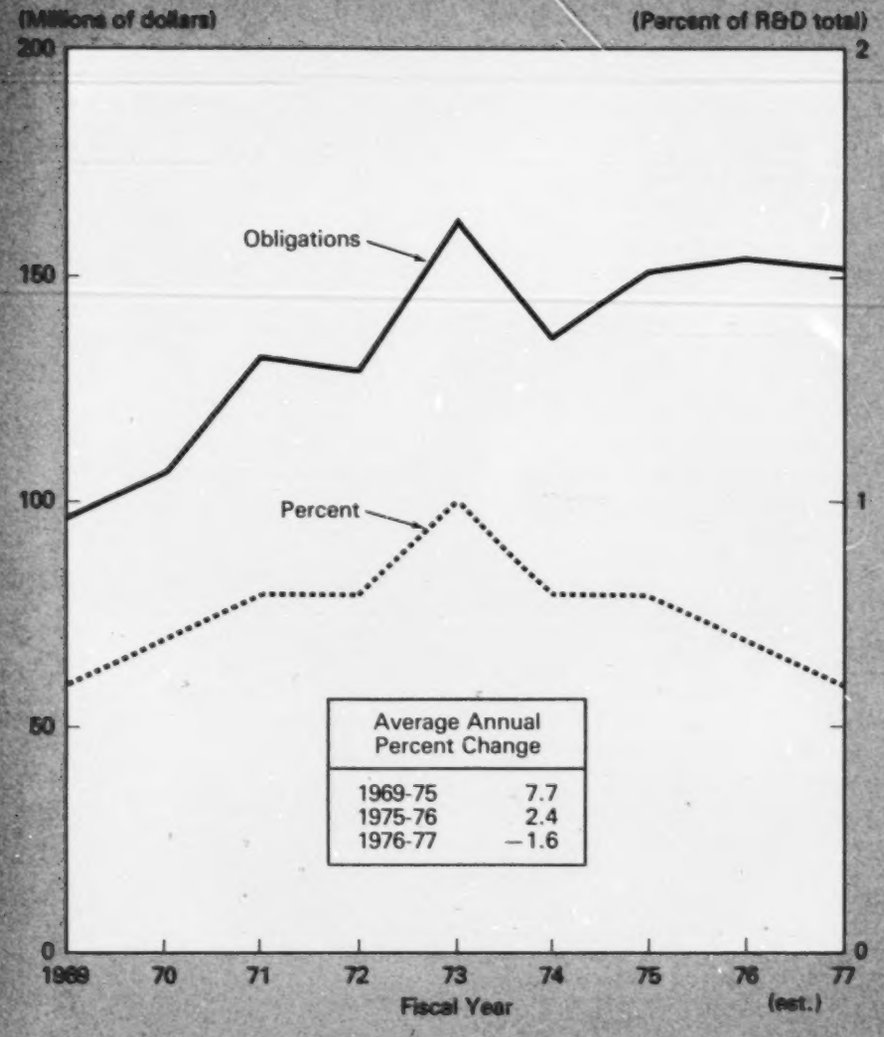
Funding of the NSF science education development and research program has dropped substantially in recent years. Program objectives now include improvement of education for careers in science, improvement of education for scientific literacy, and improvement of the effectiveness of education processes. A decline of 8 percent is planned for 1977.

Since 1975 the Office of the Assistant Secretary for Education, HEW, has been supporting a program to improve effectiveness of postsecondary education by encouraging the reform and improvement of existing policies and practices. No change in the level of funding is expected for 1977.

The OE education for the handicapped program dropped between 1969 and 1977, in terms of dollars and as a share of the education total. Work continues in this area, however, on curriculum development, teaching techniques, and such projects as physical education and recreational research for handicapped children.



INCOME SECURITY AND SOCIAL SERVICES FEDERAL R&D OBLIGATIONS



Average Annual Percent Change	
1969-75	7.7
1975-76	2.4
1976-77	−1.6

SOURCE: National Science Foundation

50

INCOME SECURITY AND SOCIAL SERVICES

- Support for income security and social services is expected to decline slightly in 1977. The high point was in 1973 when poverty-related programs were most heavily funded.

- In 1977 the share of R&D support for the income security and social services function within the Federal R&D total is expected to be six-tenths of 1 percent, the same as in 1969. The highest share was 1.0 percent in 1973.

	1969	1975	1976	1977
	[Dollars in millions]			
Income security and social services, total	$96.7	$150.7	$154.2	$151.7
	Percent distribution			
Social Security Administration (HEW)	7.6%	15.0%	16.8%	17.8%
Social service programs (OS) (HEW)	16.3	9.4	9.4	12.8
Rehabilitation services and facilities (OHD) (HEW)	29.1	13.9	13.6	12.5
Employment and Training Administration (Labor)	21.7	10.3	10.3	10.4
Child abuse (OHD) (HEW)	—	7.6	7.5	7.6
Child development research and demonstration (OHD) (HEW)	3.7	10.0	10.0	7.4
Income maintenance (OS) (HEW)	NA	8.0	6.8	7.4
Public assistance research and evaluation (SRS) (HEW)	12.9	6.4	6.0	6.1
Other	8.7	19.4	19.8	18.0

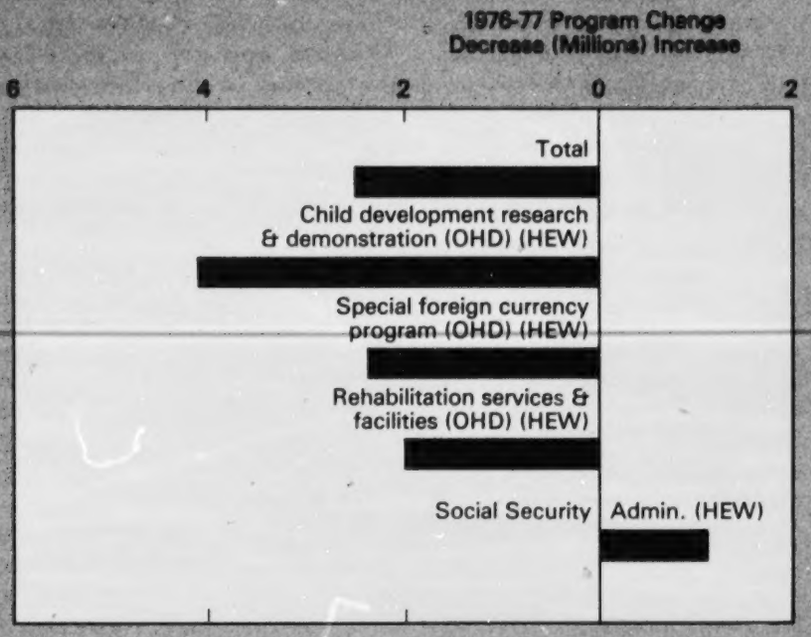
SOURCE: National Science Foundation

- In the current (1975-77) period the HEW Social Security Administration (SSA) sponsors the largest program within this function. The SSA program has almost quadrupled in size since 1969 even though the 1977 increase is only an estimated 4 percent. Research conducted by SSA contributes to the ongoing development of the social security system, covering such areas as income security and health benefits, redistributive effects of social security benefits, effects of existing social security benefit provisions on individual and family security, and the relation of public and private income-maintenance programs.

The next largest effort consists of the combined research activities of several social services programs supported by the Office of the Secretary, HEW. These programs cover health insurance research, other human services research, and basic research and statistical data, all of which are scheduled to increase substantially in 1977. Health insurance research is involved with analysis of payments and delivery of health services. Human services research covers assessment of education programs, teachers, schools, and curriculums; analysis of social services, emphasizing long-term care for institutionalized adults with chronic diseases or mental illness; and studies to improve methods for delivering human resources services. Basic research and statistical data covers the development of information on the poverty population and other social research.

The rehabilitation services and facilities program, sponsored by HEW's Office of Human Development (OHD) shows an estimated 9 percent decrease in 1977. Such questions as the nature of disability and restorative techniques, factors affecting rehabilitation, and architectural and engineering design are studied as a background for improvement of rehabilitation methods.

INCOME SECURITY AND SOCIAL SERVICES



SOURCE: National Science Foundation

The Employment and Training Administration (Labor) has shown a downward trend in R&D funding since 1969, but in 1977 is expected to remain at the 1976 level. This program effort is directed towards the development and application of information and methods needed to deal with problems of unemployment; the accomplishment of economic growth while controlling inflation and minimizing unemployment; and the raising of skill levels of the Nation's workforce. Over one-fourth of the funds are used to support university programs in manpower research and development.

In 1977 the OHD child abuse program is expected to maintain the same funding level as in 1975 when it was established. Along with efforts to demonstrate methods for preventing, identifying, and treating child abuse and neglect, the program seeks to provide information on the national incidence and severity of child abuse and neglect and on the characteristics of parents responsible for such actions.

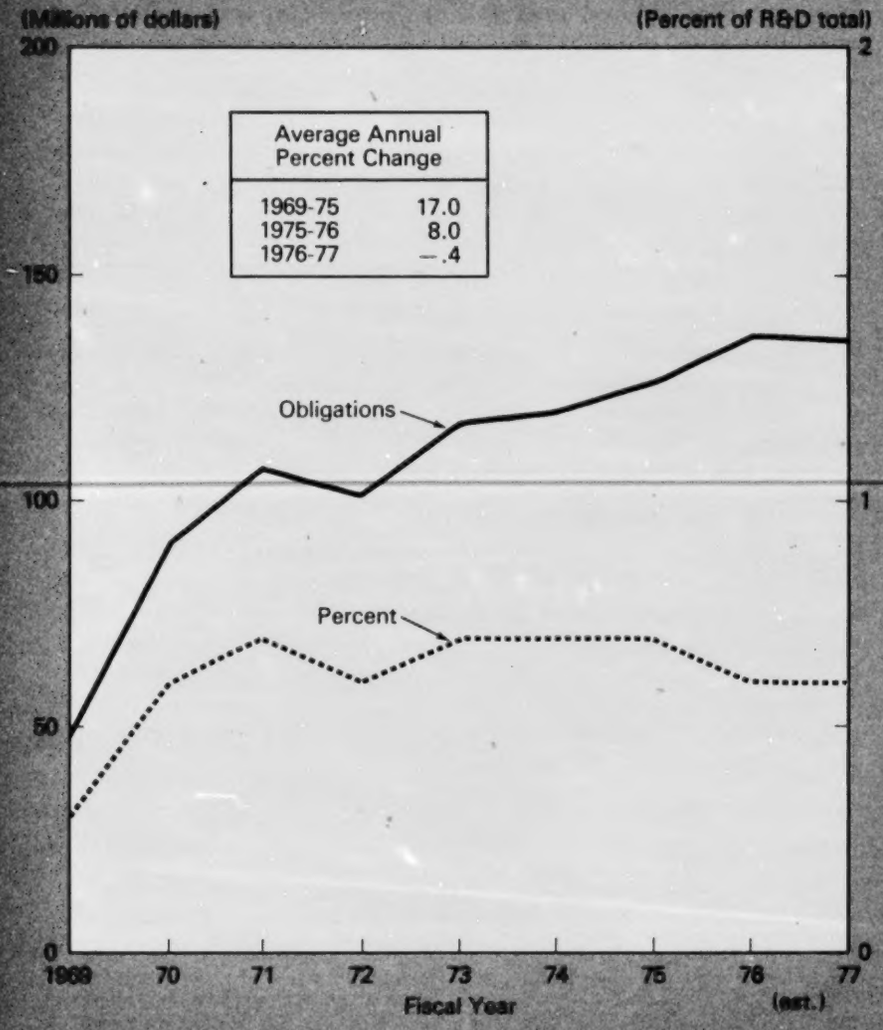
The OHD child development research and demonstration program is scheduled for a 27-percent decrease in 1977. This program supports activities in child development and welfare, and delivery of services to children and families. Areas of concern include day care, child development and family life, and children with special needs.

The income maintenance program of the Office of the Secretary, HEW, shows an 8-percent increase in 1977. This program is involved with several experiments in income maintenance and with the conduct of income dynamics research.

The public assistance research and evaluation program of HEW's Social and Rehabilitation Service (SRS) is expected to remain at the 1976 funding level. Federal grants and contracts are made to finance projects aimed at evaluating the public assistance program and demonstrating new systems for delivery of services to the disadvantaged. Projects cover such topics as income maintenance, health, and social services.

A number of other programs are found within the income security and social services function, among them OHD programs for the aging and youth development, research of the Employment Standards Administration (Labor), and NSF support to studies of distribution and equity within the broader RANN program.

AREA AND COMMUNITY DEVELOPMENT, HOUSING, AND PUBLIC SERVICES FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

126

AREA AND COMMUNITY DEVELOPMENT, HOUSING, AND PUBLIC SERVICES

- The area and community development, housing and public services function reflects one of the highest average annual growth rates for the 1969-77 period—13.5 percent. Most of this growth was achieved by 1973, although moderate rises occurred in 1975 and 1976. The 1977 funding level is scarcely changed from 1976.

- The share of this function in the Federal R&D total has risen from three-tenths of 1 percent in 1969 to an estimated six-tenths of 1 percent in 1977.

127

Trends in R&D Programs

	1969	1975	1976	1977
	[Dollars in millions]			
Area and community development, housing, and public services, total	$49.4	$126.6	$136.8	$136.3
	Percent distribution			
Department of Housing and Urban Development	42.6%	49.0%	49.8%	57.0%
Housing assistance research	(1)	12.3	11.4	11.6
State and local government research	(1)	6.5	3.9	6.3
Energy conservation and other housing research	(1)	3.2	4.7	5.6
Utility systems and other community development research	(1)	4.8	5.8	5.1
Neighborhood preservation	(1)	3.2	3.4	4.8
Housing safety and standards	(1)	3.2	3.5	4.4
Housing management and maintenance research	(1)	3.2	2.5	3.6
Other research activity	(1)	8.3	10.1	10.7
Administrative expenses	(1)	4.3	4.6	4.9
Community development (CSA)	44.6	30.8	28.5	28.6
Public service and intergovernmental programs (RANN) (NSF)	.3	5.5	6.5	6.4
Economic Development Administration (Commerce)	10.7	8.2	11.0	4.7
Other	1.8	6.5	4.2	3.2

(1) Detail not available prior to 1973. SOURCE: National Science Foundation

Comments

- Since 1970 most support for R&D programs under this function has been provided by the Department of Housing and Urban Development (HUD). In 1977 HUD programs are expected to account for almost three-fifths of the function total.

  The largest of the HUD programs involves research on direct housing assistance, testing how families use direct cash assistance for rental or home purchase payments, how the housing market responds, and how such a program can be administered. The program has remained at the same level of funding in the 1975-77 period.

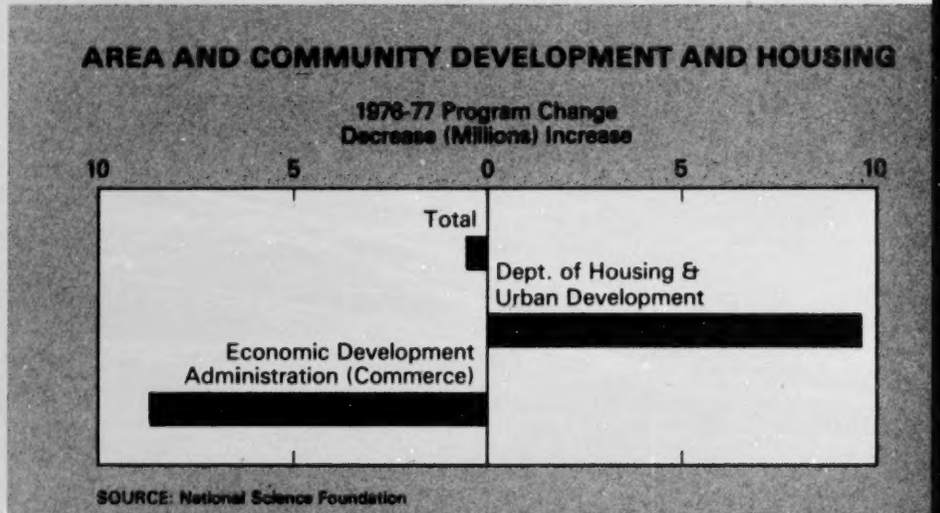
  Another HUD program, State and local government research, is aimed at assisting State and local governments to develop and adopt measures that increase their management capabilities, improve public service delivery and productivity, and encourage better utilization of Federal program funds, including shared revenues and community development block grants. This program is scheduled for a 59-percent increase in 1977.

  Other HUD programs include energy, conservation, and other housing research to promote conservation of materials and energy in housing construction; utility systems and other community development research toward more efficient utility and waste handling systems; neighborhood preservation research, housing safety and standards research (up 27 percent); housing maintenance research; and data collection and analysis, which includes the Annual Housing Survey as its largest project.

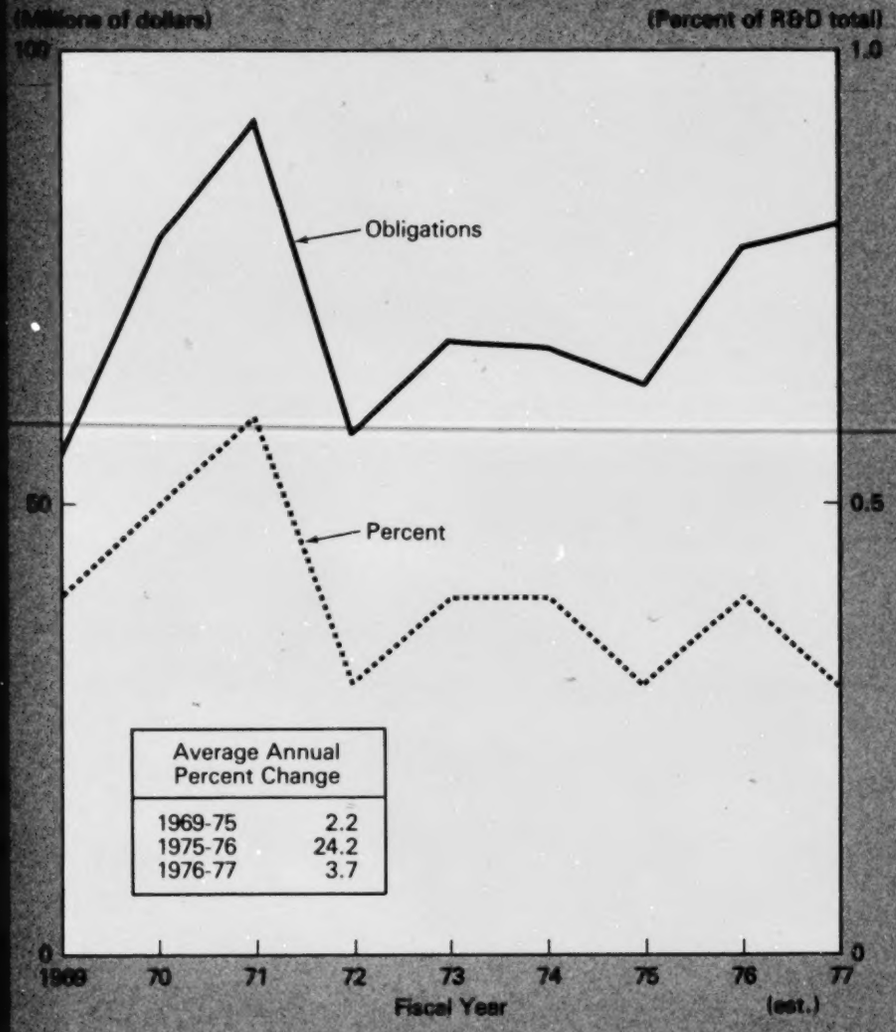
  The community development program of the Community Services Administration (CSA) accounts for more than one-fourth of the entire function in 1977. This program is directed toward providing economic and community development impact in rural and urban areas that house concentrations of low-income persons. The 1977 program will continue at the 1976 level.

  Three NSF public service and intergovernmental programs within the broader RANN program cover research on the cost, quality, and equity of local service delivery; research on service delivery technology and systems; and research designed to identify the needs of State and local governments in policy, resources, and program management.

  An Economic Development Administration (Commerce) R&D program consisting mainly of grants to local governments and contracts to nonprofit institutions to help local economic development is scheduled to drop 57 percent in 1977.



ECONOMIC GROWTH AND PRODUCTIVITY
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

ECONOMIC GROWTH AND PRODUCTIVITY

- The level of funding for economic growth and productivity has been very uneven throughout the 1969-77 period with an average annual growth rate somewhat less than the overall Federal average. The 1977 increase is expected to be 4 percent with no programs scheduled for important changes.[13]

- In 1977 this function is expected to represent three-tenths of 1 percent of the Federal R&D total, compared with four-tenths of 1 percent in 1969.

[13] This function reflects lower dollar levels than in previous reports owing to the fact that five programs related to marketing and economic research in the food area were transferred to the new food function.

Trends in R&D Programs

	1969	1975	1976	1977
	[Dollars in millions]			
Economic growth and productivity, total	$55.8	$63.3	$78.7	$81.5
	Percent distribution			
Services to improve use of materials (NBS) (Commerce)	9.4%	22.3%	21.1%	20.8%
Industry and productivity research (RANN) (NSF)	—	11.1	16.2	15.4
Forest products utilization research (FS) (USDA)	12.6	15.6	13.9	14.0
Technology utilization (NASA)	7.9	10.1	11.2	11.3
Services to improve the application of technology (NBS) (Commerce)	7.8	11.2	10.6	10.1
Postal Service	34.9	—	—	—
Other	27.4	29.7	27.0	28.4

SOURCE: National Science Foundation

Comments

- Services to improve use of materials of the National Bureau of Standards (NBS) within Commerce is currently the largest program within the economic growth and productivity function, accounting for one-fifth of the total in 1977. This program shows an almost unbroken rise since 1969. Activities include research on properties and performance that will permit the selection of materials best suited for their intended uses; research and development in pollution measurement technology; and research to develop standard reference materials used for the calibration of measurement systems and instruments.

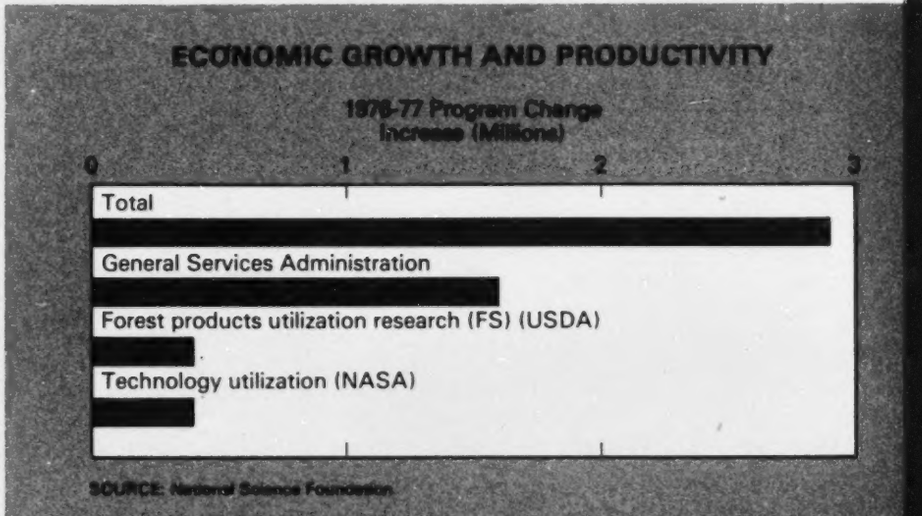
  Industry and productivity research is a heading for a group of programs sponsored by NSF within the broader RANN program. These programs cover advanced industrial processing; studies of the costs, benefits, and impacts of regulation; research on regional productivity; measurement of national productivity; studies of public/private relations; and efforts to stimulate industrial R&D programs.

  The USDA Forest Service (FS) sponsors a forest products utilization research program which seeks to develop new and improved technology for more efficient use of wood, to reduce costs, to extend timber supplies, and to reduce air and water pollution associated with wood utilization.

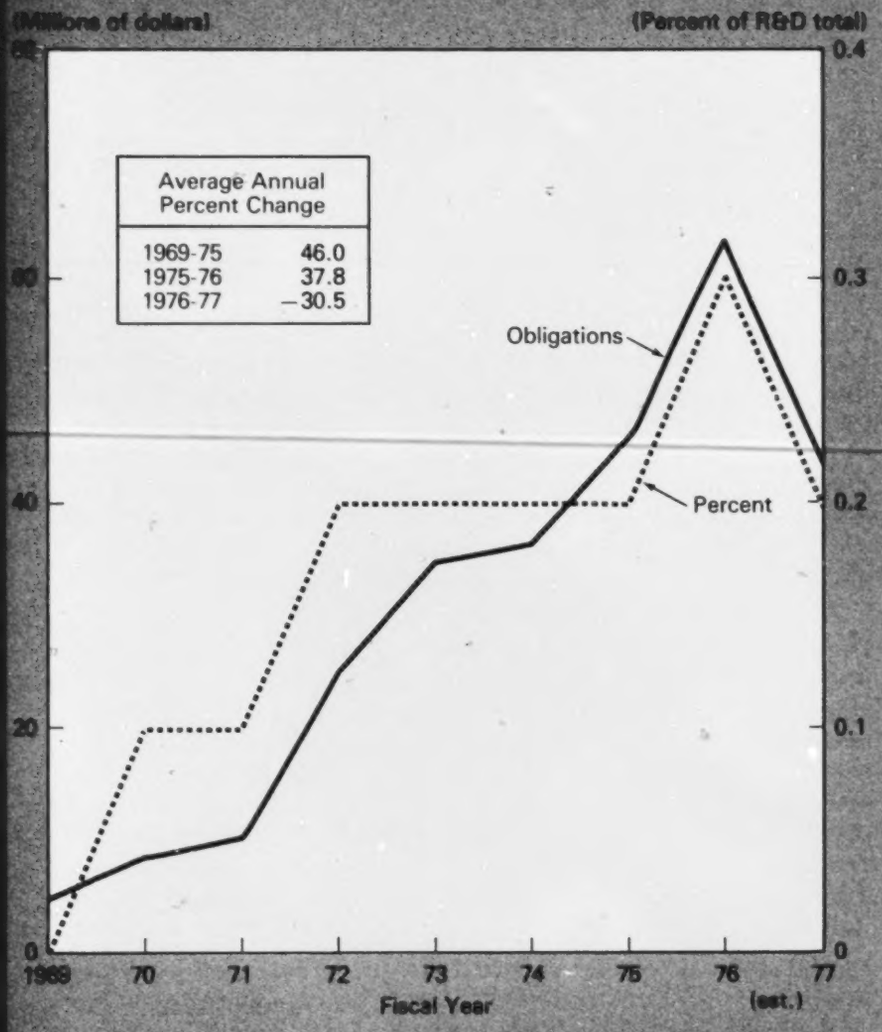
  NASA has had for many years a technology utilization program, the objective of which is to accelerate into the economy the transfer of new advances in technology generated by NASA and NASA contractors. This program shows considerable current growth.

  Another NBS program—services to improve the application of technology—covers R&D efforts to provide technological and engineering standards; measurements for products, commodities, devices, processes, or systems; and the utilization of new applications of technology. Areas of current interest include building science and technology, electronic technology, voluntary engineering standards, product performance, and radiation safety. In 1977 this program is scheduled for a slight decrease because of the transfer of the fire research program to the National Fire Prevention and Control Administration (Commerce).

  This function is completed by a total of 17 other R&D programs, among them forest economics and marketing research and forest engineering research, both conducted by the Forest Service; improvement of computer technology applications, NBS (Commerce); buildings research of the General Services Administration, and research on policy development of the Labor Management Services Administration (Labor).



CRIME PREVENTION AND CONTROL
FEDERAL R&D OBLIGATIONS



SOURCE: National Science Foundation

CRIME PREVENTION AND CONTROL

- Between 1969 and 1977 crime prevention and control shows the highest growth rate among all Federal R&D functions. In 1977, however, a 31-percent decrease is scheduled, the first decrease in the 1969-77 period. The drop is largely due to unexpectedly high obligations in 1976 occasioned by a carryover of unobligated funds from the previous year.

- The share of this function in the Federal R&D total has been less than one-half of 1 percent in each year of the 9-year timespan.

	1969	1975	1976	1977
	[Dollars in millions]			
Crime prevention and control, total	$4.8	$45.9	$63.2	$43.9
	Percent distribution			
Prevention and control of drug trafficking	12.6%	29.3%	15.2%	12.9%
Drug Enforcement Administration (Justice)	12.6	3.3	8.9	9.7
R&D on eradication of narcotic-producing plants (ARS) (USDA)	—	3.4	2.2	3.2
Drug control (LEAA) (Justice)	—	22.6	4.1	(1)
Other crime prevention and control	87.4	70.7	84.8	87.1
Law Enforcement Assistance Administration excluding narcotics control (Justice)	76.8	66.5	80.8	78.6
Bureau of Prisons (Justice)	5.1	1.4	1.5	4.4
Federal Bureau of Investigation (Justice)	5.6	2.6	2.0	3.2
Immigration and Naturalization Service (Justice)	—	.1	.5	.9

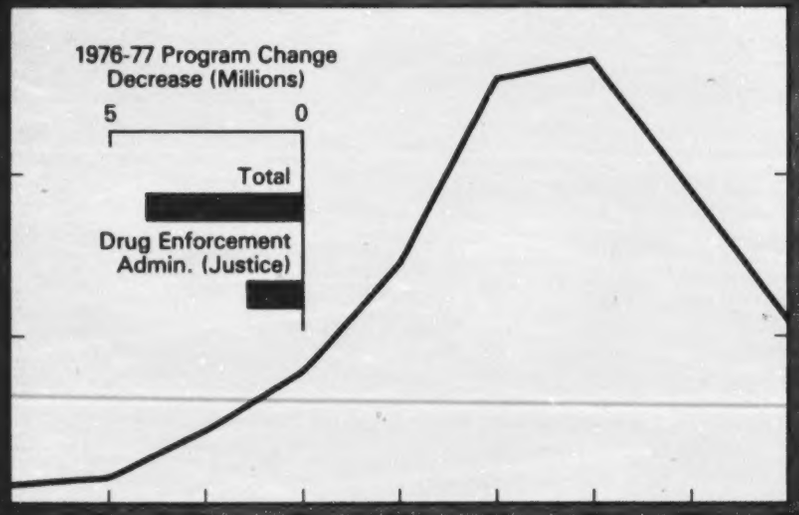
[1] Drug control is scheduled for funding under block grants to the States with no known R&D component.

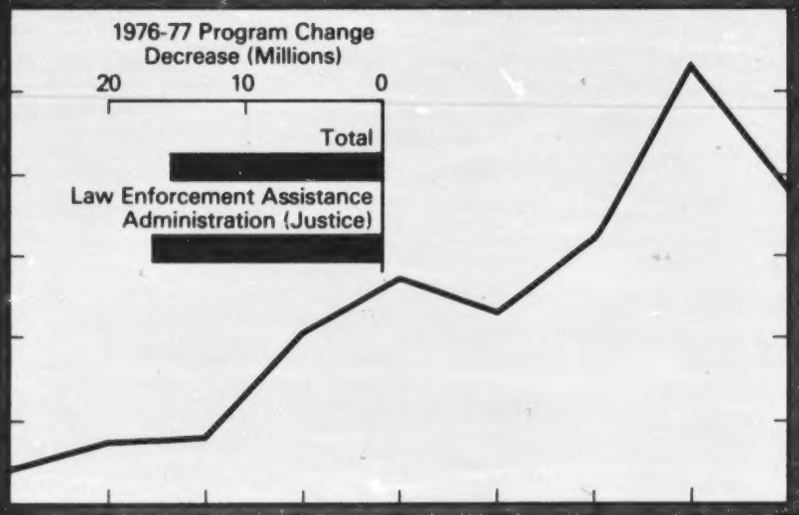
SOURCE: National Science Foundation

- **Prevention and control of drug trafficking** is a subcategory that showed steady growth from 1969 to 1975 but declined in 1976 by 29 percent and is expected to decrease again in 1977, by 41 percent. Most of this recent reduction is the result of a discontinuation of R&D support for the drug control program of the Law Enforcement Assistance Administration (LEAA) of the Department of Justice. In 1977 the drug control program was scheduled for funding under block grants to the States with any research component to be controlled at the State level.

  The Drug Enforcement Administration (DEA) of the Department of Justice, after a very sizable increase in 1976, is scheduled for a 23-percent decrease in 1977. The rescission of funds in 1975 with restoration the next year caused 1976 to be unexpectedly high. DEA research and development include drug evaluation and methodology programs as well as a law enforcement program that covers such studies as the deterrent effects of various strategies, detection of controlled substances in the body, the nature and sources of supply, and more effective methods of keeping controlled substances out of illicit channels.

  The Agricultural Research Service (USDA) program aimed at research and development of a technology for detection and destruction of illicit growth of narcotic-producing plants is expected to remain at the 1976 funding level.



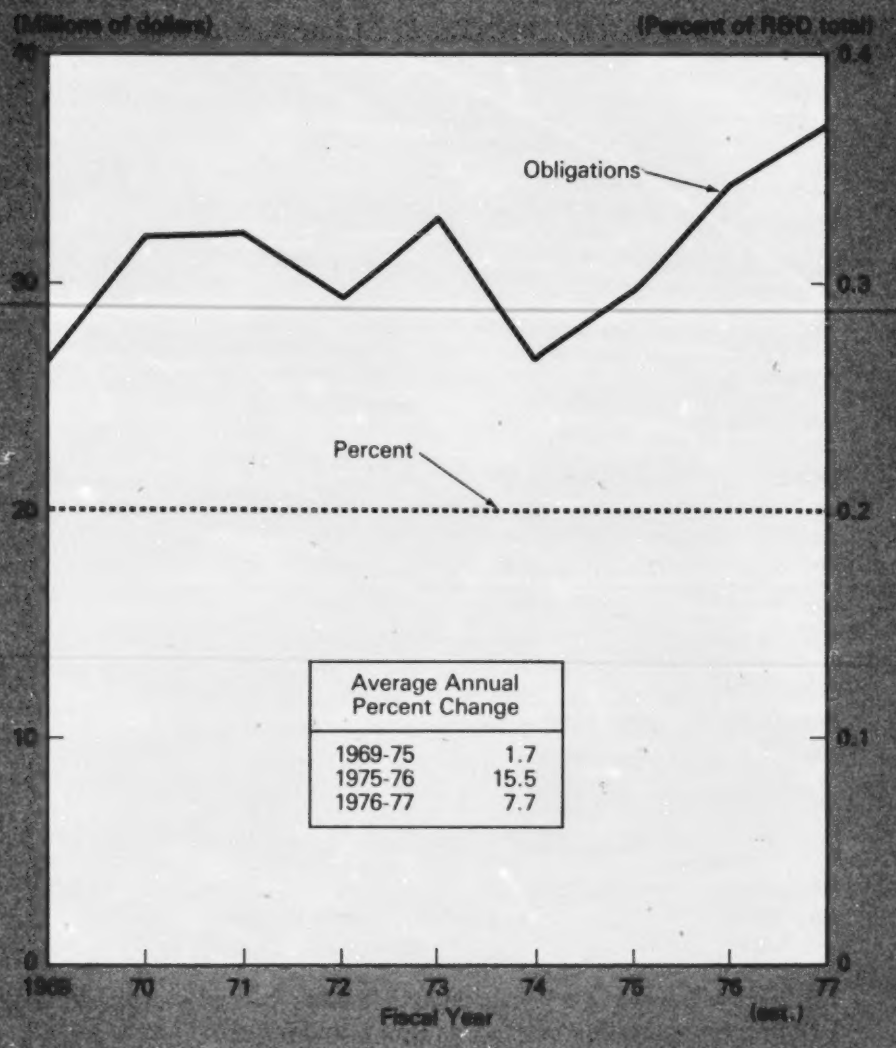


- **Other crime prevention and control** is scheduled for a decrease of 29 percent in 1977, the first decrease in the 1969-77 period. The decline is attributable partly to reduced R&D activities of LEAA but also to the fact that support for some programs was unusually high in 1976 because of the carryover of prior-year funds. Several of these LEAA activities—crime prevention, police, courts, corrections, and technology transfer—are expected to remain at the 1976 level while other activities such as equipment systems improvement, juvenile delinquency, cooperative research, and evaluation research are expected to reflect decreases.

  In 1977 the Bureau of Prisons (Justice) is expected to grow more than two times over the 1976 funding level to support comprehensive research and program evaluation of correctional activity, including differential treatment of youthful offenders, narcotic addict rehabilitation, work release and community treatment centers, staff training, furlough practices, probation, and post-release procedures.

  The Federal Bureau of Investigation (FBI) within Justice has scheduled a 17-percent increase in its 1977 program to develop a computerized fingerprint identification system. Current work covers development of a data base for computer searching.

INTERNATIONAL COOPERATION AND DEVELOPMENT FEDERAL R&D OBLIGATIONS



Average Annual Percent Change	
1969-75	1.7
1975-76	15.5
1976-77	7.7

SOURCE: National Science Foundation

INTERNATIONAL COOPERATION AND DEVELOPMENT

- The international cooperation and development function has shown little growth in the 1969-77 period. It reflects an average annual growth rate of 4.1 percent, the lowest for any function with the exception of space, which reflects a decline.

- Throughout the 1969-77 period the international cooperation and development function has accounted for two-tenths of 1 percent of the Federal R&D total.

Trends in R&D Programs

	1969	1975	1976	1977
	[Dollars in millions]			
International cooperation and development, total	$26.8	$29.8	$34.4	$37.0
	Percent distribution			
Agency for International Development (State)	72.5%	89.6%	87.2%	86.1%
U.S. Arms Control and Disarmament Agency	22.4	3.4	4.7	6.2
Departmental funds (State)	.5	4.2	4.4	4.1
International cooperative scientific activities (NSF)	1.8	2.3	2.5	3.4
Action	2.8	.6	1.3	.1

SOURCE: National Science Foundation

Comments

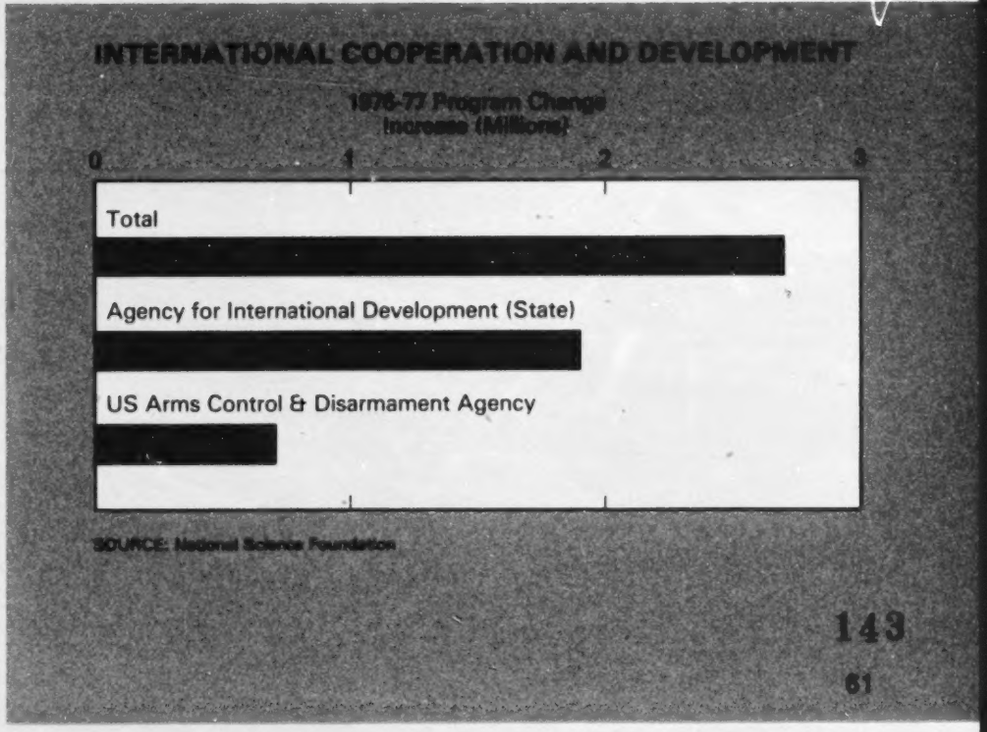
- The chief component of the international cooperation and development function is the R&D program of the Agency for International Development (AID) of the Department of State. Since 1970 AID has accounted for three-quarters or more of the funding for this function.

  The AID program furnishes technical information and expertise to AID worldwide, regional, and country programs from various sources—universities, professional associations, and private research firms. Research focuses on agriculture and nutrition, health and family planning, science and technology, and economics and related social services in the less developed countries. Research also seeks ways and means to ensure a followup impact. The total program is expected to increase 6 percent in 1977.

The R&D efforts of the Arms Control and Disarmament Agency have more than doubled since 1975 but still remain a small part of the overall function total. These efforts are aimed at support of the Strategic Arms Limitation Talks, primarily through exploration of means to limit testing of nuclear weapons, and the development of equipment and techniques to prevent proliferation of nuclear weapons under the multilateral Non-Proliferation Treaty.

The State Department sponsors planning studies related to long-range foreign relations policy issues, as well as studies on current or emerging problems, and research on new techniques for the study and management of foreign affairs and the policymaking process.

The objectives of NSF research support under its international cooperative scientific activities program is to strengthen the capability of the U.S. scientific community by providing opportunities for significant interactions between U.S. scientists and their foreign colleagues.



APPENDIXES

A. Technical Notes
B. Detailed Statistical Table

APPENDIX A

Technical Notes

These notes deal with the scope and method of compiling this report and with its relationship to other reports and studies.

Scope

This report is based entirely on data reported to the National Science Foundation by Federal agencies in the form of actual obligation levels for R&D programs for fiscal years 1969 through 1975 and estimated obligation levels for R&D programs for fiscal years 1976 and 1977. All Federal agencies with R&D programs were covered. The individual programs were assigned by NSF staff to functional categories and subcategories on the basis of the primary objective of the R&D effort, as set forth in this study, rather than the primary objective of the overall agency mission. The purpose of this analysis is to relate R&D activities to their own purposes and objectives and thus obtain a view of changes in R&D priorities over a period of time.

The sources of data were agency responses to the annual NSF survey *Federal Funds for Research, Development, and Other Scientific Activities, Volumes XIX, XX, XXI, XXII, XXIII, XXIV and XXV.* The surveys did not originally provide data on program support levels, but starting with Volume XX, obligational data were reported for programs and this new departure made possible the compilation of a report of this nature. Programs were identified in the survey by the appropriation titles and activities under which they appeared in the Federal budget. With these program data and some additional program breaks obtained by interview, the function series could be constructed from 1970 through the latest year. Comparable program data were informally obtained from the agencies for 1969.

Each new report in the function series is constructed on the basis of the agency/program structure existing at the time of the latest Federal budget. In the present report 1977 budget titles and agency program sponsorship are used, with the data back to 1969 arranged to conform to the present structure. The only exceptions are in the case of programs that have been terminated altogether but must still be shown as part of prior-year totals; these are listed in the program stub under the agencies that sponsored them at the time. Estimates in the allocation of dollar amounts to earlier programs had to be made in a number of instances because some agencies did not exist in earlier years or did not exist as independent units and because agency reorganizations and program reorganizations have sometimes resulted in program splitting.

Timing

Data obtained from the current *Federal Funds* survey for fiscal years 1975-77 are based on program requests contained in the President's budget message to Congress in January 1976. By the time the *Federal Funds* questionnaire was completed in March-April 1976, however, some revisions had been made in program levels to reflect programming or other changes such as the effect of congressional restoration of Presidential recissions.

Data for 1976 and 1977 are estimated and do not reflect final apportionment actions for 1976 or appropriation and apportionment actions for 1977 occurring after the President's budget request.

Organization

This report is organized in two major parts. Part I is concerned with broad comparisons of growth rates for the various functions throughout the 1969-77 period, and for shorter periods within that timespan, and with shifts in priorities between functional areas. Part II is concerned with a detailed analysis of each function, including a discussion of individual R&D programs under each function and subfunction and changes in programs over time. Special attention was given to significant program changes between 1976 and 1977.

Since 395 programs or program areas are covered in this report, descriptions were kept brief and were included with the analysis. The sources for program descriptions were (1) the narrative sections of the *Federal Funds* survey responses; (2) the budget *Appendix, 1977;* (3) *Special Analysis P: Federal Research and Development Programs* of the 1977 budget; and (4) congressional appropriation committee reports.

Method

Structure: The classification system in this report is based on 15 functions and 34 subfunctions that form the structure for the analysis. The categories were chosen to make visible the most important R&D objectives as reflected in agency programs in the 1977 Federal budget. Functions and subfunctions were chosen on the basis of size of effort, current and ongoing public interest in an area, and the need for a clearcut definitional framework encompassing all Federal R&D programs. No ambiguous function headings, such as "other" or "miscellaneous" were used. The function system used in this report differs from the system used in the reports based on the 1974 budget, the 1975 budget, and the 1976 budget. (See Relation to Other Reports, p. 64.)

The data are additive to 100 percent so that no overlap occurs between functions or programs, and programs are assigned to functions and subfunctions in terms of their primary R&D purposes. Such a system permits a comparison of priorities on an internally consistent and mutually exclusive basis.

Definitions: The definitions of R&D activities are those provided the agencies by NSF in its *Federal Funds* survey instructions.

The definitions of functions and subfunctions are implicit in their titles and content. Some programs, however, might appear to span more than one functional area with equal emphasis in each area. This situation has arisen in the case of some programs related to *natural resources* and *environment*. Thus, a rule was evolved that R&D programs primarily devoted to studying, inventorying, or managing resources would be placed under *natural resources* and that R&D programs primarily devoted to studying interactions within systems or studying pollution and/or its effects on living systems would be placed under *environment*. Safety programs were additionally placed under *environment* (under the *environmental health and safety* subfunction).

Also, in the case of programs that might fall between *area and community development, housing, and public services* and *income security and social services*, the criterion was established that programs primarily directed to improving the economies or general conditions of regions, including urban areas, were to be placed under the *area and community development* function and programs directed primarily to bettering the economic or social conditions of individuals were to be placed under *income security and social services*.

NSF staff decided on the assignment of all programs to given functions or subfunctions, and because all the Federal R&D programs could be studied and compared at one time, the staff could resolve fine points of difference and group like programs together.

Average annual growth rate comparisons: Tables showing average annual percent changes are based on growth rate conversion tables which provide average annual growth rates for given time spans and given ratios of terminal-year data to initial-year data. Conversion tables are based on a standard compound interest rate formula.

Relation to Other Reports

(1) Since 1952 NSF has published an annual series covering Federal R&D funding by agencies. The reports are issued under the title *Federal Funds for Research, Development, and Other Scientific Activities*. They include R&D expenditures and R&D obligations by agencies. The obligational data are further broken down by basic research, applied research, and development, as well as by performing groups, field of science, and State distribution. As noted above, the agency program data furnished for *Federal Funds*, Volumes XX, XXI, XXII, XXIII, XXIV, and XXV were used for this report to construct the series back to 1969. Overall totals in the historical tables for *Federal Funds*, Volume XXV and in this report are identical.

(2) *An Analysis of Federal R&D Funding by Budget Function, Fiscal Years 1960-1972*, published in 1971, was the first NSF report to compile and analyze Federal R&D data on a functional basis. It was based for the most part on the aggregate program totals of agencies and agency subdivisions, and did not probe deeper to the program level. It followed the function system in the Federal budget, which is shown in terms of outlays only. For comparability R&D data were shown in terms of expenditures. The R&D program distribution, which followed the budget function scheme established by the Office of Management and Budget (OMB), placed programs under function headings that embraced overall missions of the sponsoring agencies. While ratios could thus be obtained of the R&D effort to the total Federal effort in each function area, many R&D programs had to be placed under inappropriate categories.

(3) *An Analysis of Federal R&D Funding by Function, Fiscal Years 1963-1973*, published in 1972, also followed the budget function system and provided R&D data in terms of expenditures. It again placed R&D programs under functions that embraced the overall missions of sponsoring agencies, In addition, however, this report offered an alternative system whereby R&D programs were arranged by a separate set of functions that reflected the primary purposes of the programs so that a truer perspective on R&D priorities could be obtained.

(4) *An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1974*, published in 1973, was based on a classification system that evolved from the alternative approach. This report did not follow the budget function structure, which is shown in outlays, and therefore data could be shown in obligations, which more closely reflect budget planning than do expenditures. A total of 14 function headings were used, with 40 subfunctions.

Even though function headings were similar in some cases to those used in the Federal budget (e.g., national security, space, and health), the criteria for assigning R&D programs to functions differ between the two systems. Hence, ratios of R&D programs to overall Federal programs in given functional areas could not be calculated. For example, in the budget system, under the *health* function the health-related R&D programs of the Veterans Administration (VA) are omitted because they are posted under a *veterans benefits* function, whereas in the system used in this report the R&D portion of VA programs related to health are included under *health*. In all other cases where a function heading was the same in concept in this report and previous reports, the differences in overall function structures meant that the R&D program content for a function would differ somewhat between reports.

(5) *An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1975*, published in 1974, and *An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1976*, published in 1975, followed exactly the same function/subfunction structure as the 1969-1974 report. From one report to another, however, programs were sometimes shifted between functions as program purposes were reevaluated. Each report was, thus, a revised edition with changed historical series.

This report, 1969-1977, differs from the previous reports in that the structure is based on 15 functions and 34 subfunctions. A new major function has been added—*food, fiber, and other agricultural products*. The programs under this function consist of those formerly assigned to a food subfunction within *natural resources*, plus five programs formerly placed under *economic growth and productivity*.

(6) *In Special Analyses, Budget of the United States Government, Fiscal Year 1977, Special Analysis P: Federal Research and Development Programs*, OMB published estimates of obligations and expenditures for Federal research, development, and R&D plant. *Special Analysis P* included an allusion to the Federal energy R&D and R&D plant program, giving a total of $2.6 billion for energy in 1977, which compares with the $2.0 billion shown for the *energy development and conversion* function in this report, or $2.5 billion if R&D plant were included. The *Special Analysis* total was not based on a function system additive to 100 percent, and the analysis therefore could include energy-related programs whose primary goals were environment- or natural-resource-based, as well as R&D programs primarily devoted to energy. Because the function system in this report is additive to 100 percent and each R&D program was assigned to only one function or subfunction on the basis of the primary purpose of the program, the energy total is lower. For example, energy-related environmental R&D programs appear in this report under the environment function and are not included in the energy total.

(7) Other reports based on functional studies of the Federal budget have been published, some of them covering R&D data specifically. These have not followed the budget classification completely but have made certain rearrangements of data under functional headings, and retitled some of the headings. It should be stressed that every function system is judgmental and each system reflects the concerns of the times and of the needs of the audience for whom it is devised.

APPENDIX B Detailed Statistical Table

Federal R&D Obligations by Function, Subfunction, and Agency Program, Fiscal Years 1969-77

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Total, all functions	$15,641.1	$15,340.3	$15,644.2	$16,511.9	$16,821.2	$17,438.2	$19,044.3	$21,624.7	$23,487.6
National defense, total	8,353.7	7,976.3	8,106.1	8,897.7	8,997.9	8,974.6	9,620.9	10,641.4	11,987.1
Defense military	7,687.0	7,350.9	7,500.5	8,307.1	8,394.1	8,409.0	9,001.0	9,892.7	11,212.7
Military sciences (DOD-RDT&E)	603.1	506.4	510.4	538.2	466.2	428.1	404.9	442.4	513.5
Aircraft and related equipment (DOD-RDT&E)	1,055.0	1,457.0	1,727.5	2,135.2	1,880.6	1,660.3	1,647.7	1,940.5	2,260.7
Missiles and related equipment (DOD-RDT&E)	2,426.9	2,184.8	2,050.6	1,987.0	2,141.3	2,071.2	2,160.5	2,276.9	2,503.9
Military astronautics and related equipment (DOD-RDT&E)	1,064.1	618.5	448.1	378.3	421.4	585.2	527.1	582.3	592.9
Ships, small craft, and related equipment (DOD-RDT&E)	330.4	317.0	285.4	488.9	633.6	647.8	634.1	607.8	736.1
Ordnance, combat vehicles, and related equipment (DOD-RDT&E)	351.2	311.2	303.4	407.6	380.6	418.3	471.1	555.6	750.6
Other equipment (DOD-RDT&E)	1,134.3	1,113.2	1,361.4	1,512.5	1,527.2	1,611.6	1,843.6	2,096.2	2,360.8
Programwide management and support (DOD-RDT&E)	422.0	476.3	474.6	497.5	549.4	585.0	882.8	950.4	1,051.2
Other DOD military	300.1	366.5	339.1	361.8	393.7	400.5	429.1	440.6	443.1
Defense-related atomic energy	666.2	624.4	605.1	590.1	603.8	565.6	620.0	748.6	774.4
Weapons R&D and testing activities (ERDA)	[1]551.2	[1]502.6	[1]468.8	[1]451.2	[1]454.3	411.5	447.4	527.5	582.9
Naval reactor development (ERDA)	115.1	121.8	136.3	138.9	149.5	154.1	172.6	221.2	191.5
Other defense-related activities	.5	1.0	.6	.5	—	—	—	—	—
Office of Emergency Preparedness	.5	1.0	.6	.5	—	—	—	—	—
Space, total	3,731.7	3,509.9	2,893.0	2,714.3	2,601.3	2,477.6	2,511.3	2,878.5	2,940.3
Manned space flight	2,627.7	2,427.4	1,816.1	1,634.0	1,526.6	1,420.2	1,502.7	1,819.2	1,915.3
Apollo (NASA)	2,080.7	1,679.0	910.0	582.2	71.3	—	—	—	—
Space flight operations (NASA)	158.5	332.0	420.6	555.9	815.6	511.3	297.7	187.9	204.4
Skylab	141.2	324.6	402.2	534.8	484.6	179.3	—	—	—
Apollo-Soyuz Test Project	—	—	—	—	45.0	91.5	109.6	—	—
Other	17.3	7.4	18.4	21.1	286.0	240.4	188.1	187.9	204.4
Space shuttle (NASA)	—	12.5	63.1	63.8	202.0	514.7	794.4	1,201.7	1,283.3
Expendable launch vehicle development and support (NASA)	59.4	69.5	79.6	98.8	119.2	80.4	91.6	96.8	87.3
Research and program management (NASA)	329.0	334.4	342.8	333.3	318.5	313.8	319.0	332.8	340.3
Space sciences	372.6	400.5	408.4	554.3	657.4	620.0	567.2	609.8	539.0
Physics and astronomy (NASA)	150.6	129.2	122.9	117.8	139.1	133.7	150.2	183.7	187.6
Lunar and planetary exploration (NASA)	103.0	161.9	181.0	313.8	383.7	348.5	281.8	290.1	217.5
Life sciences (NASA)	39.6	19.4	14.9	17.1	21.2	21.3	19.8	20.7	22.1
Research and program management (NASA)	79.3	90.1	89.6	105.6	113.4	116.5	115.4	115.3	111.8
Space technology	407.9	368.2	340.6	236.3	161.4	152.0	154.5	167.4	186.5
Space nuclear systems (ERDA)	94.8	80.9	74.8	41.8	38.6	26.2	27.2	31.5	31.0
Space research and technology (NASA)	313.1	196.2	180.9	134.2	122.8	125.8	127.3	135.9	155.5
Nuclear power and propulsion (NASA)		91.1	84.9	60.3					
Supporting space activities	323.6	313.8	327.9	289.7	255.9	285.5	286.9	282.1	299.5
Tracking and data acquisition (NASA)	323.6	313.8	327.9	289.7	255.9	285.5	286.9	282.1	299.5
Health, total	1,126.8	1,125.8	1,340.1	1,589.9	1,626.0	2,097.9	2,178.3	2,368.3	2,268.6
Biomedical research	957.5	943.9	1,115.4	1,350.5	1,422.8	1,864.2	1,975.8	2,173.1	2,090.8
Disease control (CDC) (HEW)	16.3	14.6	20.4	16.0	15.5	16.3	13.4	19.3	16.7
National Center for Toxicological Research (FDA) (HEW)[2]	—	—	—	—	5.4	6.4	7.6	7.8	7.9
Drugs and devices (FDA) (HEW)	8.0	5.7	7.6	10.3	10.9	14.9	12.5	13.1	13.8
National Cancer Institute (NIH) (HEW)	165.7	166.5	217.8	313.5	370.6	522.3	605.0	679.4	622.5
National Heart and Lung Institute (NIH) (HEW)	135.6	135.7	170.6	206.8	226.8	306.9	306.8	348.2	328.9
National Institute of Arthritis, Metabolism, and Digestive Diseases (NIH) (HEW)	116.8	110.2	116.5	132.0	123.2	157.9	159.5	175.0	174.5
National Institute of General Medical Sciences (NIH) (HEW)	90.6	83.6	95.8	112.0	104.5	126.9	135.0	144.6	150.6
National Institute of Neurological and Communicative Diseases and Stroke (NIH) (HEW)	102.9	79.5	85.6	98.7	91.2	124.3	130.0	136.4	140.8

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	1977
National Institute of Allergy and Infectious Diseases (NIH) (HEW)	$78.5	$84.2	$89.6	$96.2	$90.1	$111.3	$110.7	$118.8	$128.2
National Institute of Child Health and Human Development (NIH) (HEW)	57.0	61.3	80.0	101.9	99.3	128.5	130.0	126.4	121.9
National Institute of Dental Research (NIH) (HEW)	21.9	21.7	28.5	36.4	36.5	40.6	44.2	45.7	48.7
National Eye Institute (NIH) (HEW)	[3]	18.8	25.2	32.1	29.8	39.2	39.3	45.4	42.9
National Institute on Aging (NIH) (HEW)	[4]	[4]	[4]	[4]	[4]	[4]	[4]	17.6	24.6
Division of Research Resources (NIH) (HEW)	79.5	66.1	65.8	74.5	98.6	129.5	126.7	130.0	92.0
John E. Fogarty International Center (NIH) (HEW)	.2	1.5	2.2	2.5	3.9	5.0	5.7	5.7	7.5
National Library of Medicine (NIH) (HEW)	4.9	4.2	4.2	5.4	4.5	5.3	5.0	5.2	7.5
Scientific activities overseas (NIH) (HEW)	7.3	4.5	10.4	3.8	2.5	.9	.5	2.3	2.3
Office of the Director (NIH) (HEW)	—	6.6	7.1	9.3	9.2	10.8	14.7	13.0	13.8
Division of Biologic Standards (NIH) (HEW)	6.3	5.6	6.7	5.6	—	—	—	—	—
National Institute of Environmental Health Sciences (NIH) (HEW)[2]	13.8	13.3	16.7	22.8	23.6	27.3	32.4	35.9	43.7
Office of International Health (HEW)	—	—	—	—	.7	2.7	—	—	—
Aviation medicine (FAA) (DOT)	2.0	1.9	2.1	2.4	2.8	3.1	2.9	3.1	3.6
Medical and prosthetic research (VA)	50.2	58.6	62.6	68.4	73.3	84.0	93.8	100.3	98.6
Mental health	100.6	94.2	99.5	104.7	85.7	108.3	94.3	96.8	83.8
Mental health research (ADAMHA) (HEW)	100.6	94.2	99.5	104.7	85.7	108.3	94.3	96.8	83.8
Delivery of health care, total	53.5	70.4	103.8	98.6	68.0	66.2	58.3	51.6	48.9
Health services research and evaluation (HRA) (HEW)	41.6	38.3	56.3	56.2	46.9	51.6	37.9	32.2	32.9
National health statistics (HRA) (HEW)	1.2	1.1	.6	.6	1.8	.6	1.7	2.2	1.5
Maternal and child health services (HSA) (HEW)	6.2	5.9	5.7	5.9	5.9	5.7	6.6	4.8	4.8
Family planning services (HSA) (HEW)	—	—	1.1	2.6	2.5	2.5	1.6	2.0	2.0
Patient care and special health services (HSA) (HEW)	2.0	1.9	2.0	2.1	2.8	3.2	2.9	3.3	3.7
Indian health services (HSA) (HEW)	.6	.6	.7	.8	.8	.9	1.0	1.0	1.0
Special foreign currency program (HSA) (HEW)	1.9	.5	3.4	1.5	1.2	.1	.8	.3	1.7
Emergency medical services (HSA) (HEW)	—	—	—	—	—	—	4.4	4.5	—
Health and nutrition (OEO)[5]	—	22.2	32.0	27.7	4.4	—	—	—	—
Instrumentation technology (RANN) (NSF)	—	—	2.0	1.1	1.7	1.5	1.4	1.3	1.3
Drug abuse prevention and rehabilitation	15.2	17.3	21.3	36.1	49.5	59.2	49.9	46.8	45.0
Drug abuse research (VA)	—	—	.3	.7	1.0	.8	1.0	1.0	1.0
Special Action Office for Drug Abuse Prevention	—	—	—	—	12.0	11.1	3.8	—	—
Drug abuse research (ADAMHA) (HEW)	10.2	12.1	14.5	27.3	29.6	34.0	34.0	34.0	34.0
Alcoholism research (ADAMHA) (HEW)	5.0	5.2	6.6	8.1	6.9	13.3	11.1	11.8	10.0
Energy development and conversion, total	327.9	317.3	323.6	382.7	441.6	605.1	1,109.7	1,631.5	2,021.1
Nuclear	305.9	295.9	285.8	334.9	376.5	469.7	674.3	875.5	1,268.8
Magnetic fusion (ERDA)	26.5	27.7	28.3	31.0	37.0	53.0	97.9	131.7	168.0
Laser fusion (ERDA)	[6]	[6]	[6]	[6]	[6]	36.9	45.6	65.5	71.4
Fission power reactor development (ERDA)	209.0	194.3	195.6	234.0	255.9	286.3	377.9	445.4	630.3
Uranium enrichment-process development (ERDA)	26.1	27.9	26.0	30.7	35.0	45.4	33.3	48.4	62.7
Fuel cycle research and development (ERDA)							34.0	65.3	163.0
Advanced isotope separation techniques (ERDA)	—	—	—	—	.8	3.3	21.1	29.5	36.8
Applied energy technology (ERDA)	19.7	20.1	13.8	12.6	10.6	[7]	[7]	[7]	[7]
Nuclear explosion applications (ERDA)	—	—	—	—	—	—	—	—	1.3
Reactor safety (ERDA)	—	—	—	—	—	—	—	—	33.3
Reactor safety research (NRC)	24.5	26.0	21.7	26.4	33.9	41.7	60.4	81.9	89.0
Safeguards research (NRC)	—	—	—	—	—	.6	1.3	4.9	9.9
Advanced energy conversion (TVA)	—	—	.4	.3	3.4	2.5	2.7	3.1	3.1
Fossil	19.9	17.7	31.5	35.9	46.6	81.4	269.1	487.3	422.8
Integrated nonnuclear energy research (OS) (Interior)	—	—	—	—	—	—	1.6	.7	.7
Coal utilization (ERDA)	15.2	12.6	25.2	29.3	39.6	69.9	228.7	417.4	354.5
Petroleum and natural gas (ERDA)	2.5	2.7	2.7	3.1	3.4	7.9	26.0	45.3	36.9

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	197
In situ technology (ERDA)	$2.2	$2.4	$2.5	$2.6	$2.6	$2.8	$9.8	$22.5	$30.
Fossil energy research (RANN) (NSF)	—	—	1.0	1.0	1.0	.8	3.0	1.3	–
Solar, geothermal, and advanced energy systems	—	—	—	2.4	5.2	19.1	82.8	148.7	190.
Solar energy development (ERDA)	—	—	—	—	—	3.9	39.9	110.6	141.
Geothermal energy development (ERDA)	—	—	—	—	—	6.2	25.0	32.9	48.
Solar conversion research (RANN) (NSF)	—	—	—	1.7	4.0	8.0	14.8	3.9	–
Geothermal energy research (RANN) (NSF)	—	—	—	.7	1.1	.9	3.0	1.3	–
Conservation	2.1	2.4	4.3	8.0	10.3	24.2	64.4	99.0	133.
Bonneville Power Administration (Interior)	2.1	1.8	1.9	2.5	2.8	2.4	6.0	8.6	3.
Energy conservation (OS) (DOT)	—	—	—	.4	.4	3.3	6.0	5.0	6.
Electric energy systems and energy storage (ERDA)	—	—	.2	1.0	.7	8.9	24.0 9.8	34.2 41.2	41. 71.
End use conservation and technologies to improve efficiency (ERDA)	—	.3	1.0	2.7	3.1	3.3	10.3	1.1	–
Energy conversion and storage (RANN) (NSF)	—	—	—	—	—	.6	.8	.2	–
Advanced automotive propulsion (RANN) (NSF)	—	.3	1.0	1.5	2.2	1.8	1.0	.2	–
Energy and fuel transportation (RANN) (NSF)	(8)	.1	.2	—	[9]1.2	[9]3.9	[9]6.3	[9]8.3	[9]9.
Improvements in power systems technology (TVA)	—	—	—	—	—	(8)	.1	.3	–
Biothermal research (TVA)	—	1.3	2.0	1.4	3.0	10.8	19.1	21.1	6.
Other	—	—	—	—	—	—	1.3	3.0	6.
Federal Energy Administration	—	1.3	2.0	1.4	3.0	3.7	4.5	1.6	–
Energy systems (RANN) (NSF)	—	—	—	—	—	7.2	13.3	16.5	–
Energy programs (NASA)									
Science and technology base, total	513.4	524.6	523.7	601.2	604.4	694.3	781.3	857.0	976.
Basis for national physical measurement system (NBS) (Commerce)	16.4	18.0	14.6	15.6	15.8	18.1	18.9	21.3	21.
Patent and Trademark Office (Commerce)	.4	.4	.6	.6	.6	.5	.5	.4	–
High-energy physics (ERDA)	118.6	120.5	118.5	116.4	122.6	125.8	136.2	152.8	167.
Basic energy sciences (ERDA)	128.5	129.6	124.0	117.4	117.7	127.0	155.5	174.0	182.
Library of Congress	1.8	1.9	2.5	2.3	2.6	2.2	2.6	3.0	3.
Sustaining university program (NASA)	8.9	7.7	—	—	—	—	—	—	–
Materials processing in space (NASA)	—	—	—	—	—	4.3	6.5	8.2	13.
Mathematical sciences research project support (NSF)	12.7	12.7	12.9	13.9	14.3	15.3	17.2	18.3	21.
Computer research project support (NSF)	11.4	13.0	9.9	12.5	9.4	10.3	12.3	13.2	16.
Physics research project support (NSF)	25.7	23.8	25.5	32.7	33.4	38.7	44.1	46.9	57.
Chemistry research project support (NSF)	17.8	17.4	19.6	23.1	21.3	28.1	34.2	37.1	44.
Engineering research project support (NSF)	16.0	16.7	14.1	25.1	25.0	29.6	35.8	38.0	46.
Materials research project support (NSF)	7.8	7.7	11.1	33.3	31.9	37.5	45.5	49.1	56.
Astronomy research project support (NSF)	6.8	5.8	6.7	7.8	8.2	9.8	10.0	10.3	14.
Atmospheric sciences research project support (NSF)	8.2	7.9	9.4	11.5	11.5	12.9	14.0	15.1	19.
Earth sciences research project support (NSF)	7.9	7.8	8.1	9.5	9.1	11.6	13.5	14.3	19.
Oceanography research project support (NSF)	11.0	8.9	10.0	12.6	12.1	14.1	15.9	16.3	19.
Physiology, cellular and molecular biology research project support (NSF)	27.6	28.0	26.6	34.5	27.2	38.4	43.7	46.8	56.
Behavioral and neural sciences research project support (NSF)	8.2	8.8	13.0	15.1	14.4	17.5	19.3	20.7	25.
Environmental biology research project support (NSF)	7.0	8.6	8.5	10.3	17.6	22.9	27.2	29.5	33.
Social sciences research project support (NSF)	10.8	10.9	12.9	16.5	16.4	18.8	18.5	18.9	22.
Support of oceanographic facilities operations (NSF)	8.6	7.4	8.2	9.6	10.0	14.6	16.3	15.9	19.
Solar eclipse support (NSF)				.1	.7	(8)	(8)	.2	–
Ocean sediment coring program (NSF)	2.4	6.6	7.1	9.1	9.7	11.7	[10]12.3	[10]15.8	[10]17.
Science information activities (NSF)	6.4	7.0	7.0	7.5	9.4	7.9	5.4	6.0	6.
National Astronomy and Ionosphere Center (NSF)	—	1.4	2.3	3.0	2.8	3.4	3.3	3.8	4.
Kitt Peak National Observatory (NSF)	5.6	6.4	7.1	7.3	6.2	8.2	7.2	7.8	8.
Cerro-Tololo Inter-American Observatory (NSF)	1.2	1.5	2.0	2.1	2.0	2.4	2.5	3.1	3.

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	1977
National Radio Astronomy Observatory (NSF)	$7.3	$5.1	$6.8	$6.5	$6.1	$7.5	$5.8	$5.8	$6.9
National Center for Atmospheric Research (NSF)	10.4	11.2	14.0	17.2	14.3	18.4	18.2	23.7	23.9
Exploratory research and technology assessment (RANN) (NSF)	—	1.0	1.4	1.2	.7	1.2	1.3	1.4	1.4
Science Assessment, Policy, and Planning (NSF)	1.0	.7	1.3	1.8	3.6	6.4	10.2	8.1	5.5
Special foreign currency program (NSF)	—	—	1.0	1.9	3.5	4.4	2.2	3.9	4.3
Office of Science and Technology	1.8	1.9	2.0	2.0	—	—	—	—	—
Basic research support (Smithsonian)	14.8	18.2	15.1	21.3	24.0	24.7	24.8	27.2	33.4
Environment, total	315.2	354.1	464.7	533.3	651.8	693.3	837.4	974.6	974.0
Environmental health and safety	119.4	140.2	149.2	187.2	201.9	217.7	282.8	390.3	402.6
Human health and safety research (ARS) (USDA)	8.5	9.5	9.8	12.9	15.4	15.6	8.5	9.2	9.8
National Fire Prevention and Control Administration (Commerce)	—	—	—	—	—	—	3.6	6.4	6.1
National Institute for Occupational Safety and Health (CDC) (HEW)	15.1	10.7	12.2	19.0	23.0	28.7	29.2	31.3	36.2
Food safety research (FDA) (HEW)	NA	14.8	12.9	13.6	10.0	13.2	10.3	10.4	10.7
Radiological products research (FDA) (HEW)	[11]4.7	[11]4.2	[11]4.6	[11]5.7	3.9	9.0	5.4	5.5	5.6
Special foreign currency program (FDA) (HEW)	—	.5	.6	.8	—	—	—	—	—
Health and safety research (Bu. of Mines) (Interior)	2.2	10.9	20.8	32.3	30.9	30.7	31.9	34.9	35.2
Occupational Safety and Health Administration (Labor)	.1	.1	.3	.2	.9	1.4	2.0	2.3	6.3
Consumer Product Safety Commission	—	—	—	—	.3	4.3	6.0	5.8	5.6
Air quality effects research (EPA)	([12])	([12])	([12])	5.4	10.7	2.1	15.2	21.8	20.7
Water pollution effects research (EPA)	([12])	([12])	([12])	1.3	.1	([8])	1.1	2.7	2.9
Pesticides effects research (EPA)	([12])	([12])	([12])	1.8	2.0	2.0	2.5	9.0	8.5
Radiation effects research (EPA)	([12])	([12])	([12])	1.6	2.0	1.2	1.5	1.8	.9
Interdisciplinary effects research (EPA)	—	—	—	3.9	3.5	3.5	3.2	6.9	4.9
Water supply effects research (EPA)	—	—	—	—	1.4	2.1	2.9	12.6	13.2
Toxic substances effects research (EPA)	—	—	—	—	—	—	.6	1.4	1.5
Energy-related environmental effects research (EPA)	—	—	—	—	—	—	13.9	39.5	36.2
Biomedical and environmental research (ERDA)	88.8	89.5	88.1	88.5	97.8	103.9	142.5	174.3	182.9
Environmental and fuel cycle research (NRC)	—	—	—	—	—	—	2.5	14.3	15.5
Understanding, describing, and predicting the environment	114.6	112.1	152.6	174.8	224.9	235.6	240.6	265.0	287.0
Fire and atmospheric science research (FS) (USDA)	3.1	3.5	3.7	4.9	7.0	7.5	8.1	8.2	8.5
Environment programs (NOAA) (Commerce)	23.0	27.2	44.3	49.9	46.2	47.3	52.3	53.0	55.9
Basic environmental services (NOAA) (Commerce)	([13])	([13])	([13])	21.7	23.2	19.2	24.8	22.5	24.3
Public forecast and warning services (NOAA) (Commerce)	([13])	([13])	([13])	6.1	6.6	6.6	8.2	8.5	8.9
Specialized environmental services (NOAA) (Commerce)	([13])	([13])	([13])	5.3	3.5	3.0	3.4	4.5	4.5
Weather modification (NOAA) (Commerce)	([13])	([13])	([13])	5.0	4.2	6.1	6.2	6.4	5.9
Environmental data and information services (NOAA) (Commerce)	([13])	([13])	([13])	1.5	1.2	1.7	2.6	3.1	3.1
Global monitoring of climatic changes (NOAA) (Commerce)	([13])	([13])	([13])	.2	.4	.6	2.1	2.5	2.2
Mapping, charting, and surveying services (NOAA) (Commerce)	([13])	([13])	([13])	4.8	4.4	6.9	4.3	4.3	5.2
Maritime technology (NOAA) (Commerce)	([13])	([13])	([13])	5.4	2.8	3.1	.9	1.1	1.8
Marine ecosystems investigations (NOAA) (Commerce)	—	—	—	—	3.7	4.7	5.2	9.6	8.1
International projects (NOAA) (Commerce)	NA	.8	.6	4.4	5.8	8.5	6.4	8.8	8.9
Environmental satellite services (NOAA) (Commerce)	2.9	3.1	3.0	3.0	2.9	4.4	5.1	5.2	5.8
Mapping of earthquake geologic hazards and earthquake prediction (GS) (Interior)	1.2	1.4	1.5	1.8	5.6	7.7	11.0	11.2	10.5
Aviation weather (FAA) (DOT)	.5	.8	.6	2.2	1.5	2.2	1.8	2.1	3.2

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Earth dynamics monitoring and forecasting (NASA)	$73.4	$59.8	$65.7	$5.6	$11.8	$22.7	$16.8	$12.7	$6.6
Ocean condition monitoring and forecasting (NASA)							23.4	29.8	47.6
Weather and climate observation and forecasting (NASA)				62.3	86.5	81.1	60.9	64.2	54.5
International Biological Program (NSF)	.8	4.0	7.5	9.5	9.3	(14)	(14)	(14)	(14)
Global Atmospheric Research Program (NSF)	.5	1.5	1.9	2.4	3.3	3.2	4.2	4.2	5.0
Climate dynamics (NSF)	—	—	—	—	—	—	1.0	2.1	5.1
Environmental forecasting (IDOE) (NSF)	—	—	7.1	7.8	6.1	3.5	5.3	5.5	6.5
Arctic Research Program (NSF)	—	—	2.0	3.6	3.3	4.0	3.5	3.8	4.0
U.S. Antarctic Research Program (NSF)	6.9	7.4	7.8	8.7	19.7	24.5	25.1	30.2	43.9
Weather modification (RANN) (NSF)	2.4	2.6	3.4	4.5	5.2	3.9	4.0	4.9	4.5
Earthquake engineering (RANN) (NSF)	—	—	1.0	3.2	5.1	8.4	5.6	7.4	7.1
Fire research (RANN) (NSF)	—	—	2.6	1.1	1.8	1.7	.7	1.2	—
Social response to natural hazards (RANN) (NSF)	—	—	—	—	—	—	.3	.8	1.5
Pollution control and environmental protection	81.2	101.7	162.9	171.4	224.9	240.0	314.0	319.3	284.4
Environmental quality studies (Civil Functions) (DOD)	—	—	—	.4	1.9	2.1	2.1	2.7	2.0
Air and noise pollution (FAA) (DOT)	.4	1.2	.1	5.5	5.3	4.5	6.4	6.4	6.0
Air pollution and environmental protection (FHA) (DOT)	(8)	.2	.3	.8	.9	1.1	1.3	1.0	1.4
Pollution control and abatement (OS) (DOT)	.7	.5	1.9	12.7	10.1	8.7	4.9	1.7	1.4
Control of pollution from spillage and waste (CG) (DOT)	.2	1.6	3.2	6.8	7.8	8.1	5.4	7.4	6.0
Pollution control and abatement (UMTA) (DOT)	—	1.9	3.4	1.1	—	.1	.5	.3	.5
Air quality control (EPA)	[12]32.2	[12]44.1	[12]54.5	48.2	63.6	51.6	47.4	37.7	30.0
Water quality control (EPA)	[12]33.6	[12]32.1	[12]64.9	45.4	52.3	57.6	49.5	47.9	37.2
Solid waste management (EPA)	5.5	5.1	10.4	7.7	30.7	7.0	7.9	5.3	4.4
Pesticides control (EPA)	NA	[12]5.0	[12]5.2	2.2	3.1	7.6	9.2	2.3	3.2
Radiation protection (EPA)	[12]3.1	[12]2.2	[12]1.7	1.3	.4	1.6	1.1	.1	—
Interdisciplinary studies (EPA)	—	—	(8)	3.5	10.1	14.6	19.2	17.7	22.0
Water supply control (EPA)	—	—	—	—	.7	.8	1.4	.2	1.1
Toxic substances research (EPA)	—	—	—	—	—	—	.5	(8)	—
Energy-related environment control programs (EPA)	—	—	—	—	—	17.6	80.7	104.5	58.2
Nuclear materials security and safeguards (ERDA)	2.5	4.4	3.8	3.8	4.0	4.4	6.2	13.6	25.7
Operational safety (ERDA)	.6	.8	3.2	5.0	5.7	11.6	3.3	6.9	7.2
Environmental control technology (ERDA)							8.2	12.6	15.0
Environmental quality monitoring (NASA)	—	—	—	3.2	3.1	22.4	39.6	31.7	39.6
Environmental quality (IDOE) (NSF)	—	—	2.3	5.4	4.7	4.9	4.6	5.0	5.2
Environmental effects of energy (RANN) (NSF)	—	—	—	—	—	1.1	1.2	1.3	—
Regional environmental systems (RANN) (NSF)	—	.3	4.3	10.2	11.1	6.1	8.1	6.7	6.2
Chemical threats to man and environment (RANN) (NSF)	—	.3	1.5	5.0	6.5	6.0	4.9	5.8	5.9
Regional water quality management (TVA)	1.3	.6	.4	.4	.5	.6	.5	.5	.2
Control of reservoir ecology (TVA)	.3	.4	.4	.5	.5	—	—	—	—
Environmental quality projects (TVA)	(8)	.1	.1	.3	—	—	—	—	—
Environmental R&D (TVA)	—	—	.2	.2	—	—	—	—	—
Air pollution studies (TVA)	.8	1.0	1.0	1.8	2.1	—	—	—	—
Transportation and communications, total	458.1	590.2	778.7	614.6	630.1	702.9	640.5	711.3	702.5
Air	315.8	406.3	553.5	316.5	307.1	416.1	395.3	405.0	427.6
Civil supersonic aircraft (DOT)	93.8	160.5	264.0	—	—	—	—	—	—
Air traffic control (FAA) (DOT)	25.9	29.7	51.8	49.3	37.0	39.3	39.7	41.8	54.1
Navigation (FAA) (DOT)	4.3	4.7	11.0	11.5	16.5	26.3	18.6	23.0	17.9
Other air transportation R&D (FAA) (DOT)	13.2	17.7	16.6	30.0	16.4	49.6	36.2	24.9	23.2
Civil Aeronautics Board	.2	.3	.3	.3	.3	.4	.4	.5	.5
Aeronautical research & technology (NASA)	178.3	193.4	209.9	225.4	237.0	300.5	300.4	314.8	331.4

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	197
Ground	$70.3	$81.7	$110.5	$153.8	$179.0	$192.2	$157.0	$218.1	$192
Federal Highway Administration (DOT)[15]	29.2	32.6	26.5	19.9	22.7	39.7	43.4	46.0	39
Railroad research (FRA) (DOT)	.2	.4	1.2	8.3	35.5	33.5	32.4	68.6	42
High speed ground transportation R&D (FRA) (DOT)	11.5	11.2	20.4	18.1					
National Highway Traffic Safety Administration (DOT)	10.9	19.5	26.7	50.0	54.6	53.6	34.0	49.2	42
Urban Mass Transportation Administration (DOT)[15]	18.5	18.1	35.6	57.6	66.2	65.4	47.2	54.4	67
Water	24.6	29.4	39.1	45.8	43.7	36.5	33.3	32.0	32
Maritime Administration (Commerce)	8.1	12.6	20.7	22.2	23.8	23.1	22.9	21.4	19
Coast Guard (DOT)[15]	16.5	16.8	18.4	23.6	19.9	13.4	10.4	10.6	12
Multimodal	4.1	8.5	13.4	10.5	13.1	17.8	20.4	27.0	22
Office of the Secretary (DOT)[16]	4.1	8.5	13.4	10.5	13.1	17.8	20.4	27.0	22
Communications	43.2	64.3	62.3	88.1	87.2	40.3	34.5	29.2	29
Office of Telecommunications (Commerce)	—	—	2.1	3.6	3.5	1.6	1.3	1.2	1
Federal Communications Commission	.9	1.0	.6	.7	1.1	.9	1.1	2.0	1
Office of Telecommunications Policy	—	—	.2	1.2	.6	.3	4.1	3.1	2
U.S. Information Agency	.1	.2	.1	.1	.1	.1	.1	.1	
Communications satellite program (NASA)	42.3	63.1	59.3	81.0	79.8	36.3	20.3	14.8	15
Information management (NASA)	—	—	—	—	—	—	4.5	4.6	4
Telecommunications (RANN) (NSF)	—	—	—	1.6	2.0	1.1	3.0	3.4	3
Natural resources, total	201.0	237.5	326.0	354.0	341.0	340.8	438.8	504.4	521
Mineral	42.0	47.1	54.0	54.6	60.2	76.0	146.6	186.1	170
Metallurgy research (Bu. Mines) (Interior)	11.3	12.2	13.1	13.7	15.2	15.8	17.8	28.7	21
Mining research (Bu. Mines) (Interior)	7.4	8.0	8.9	5.7	6.4	12.9	50.5	74.1	71
Engineering, evaluation, and demonstration (Bu. Mines) (Interior)	—	—	1.3	2.8	4.6	5.3	—	—	—
Other mineral resources programs (Bu. Mines) (Interior)	3.1	3.3	2.1	1.8	1.4	1.4	1.4	1.2	1
Geologic and mineral resources surveys (GS) (Interior)	19.7	22.8	22.6	25.2	27.8	34.5	70.0	71.7	66
Conservation of lands and minerals (GS) (Interior)	.6	.7	.7	1.8	1.9	2.6	3.7	4.8	5
Seabed assessment (IDOE) (NSF)	—	—	5.3	3.7	2.9	3.5	3.1	3.1	3
Mineral market behavior (RANN) (NSF)	—	—	—	—	—	—	.2	.4	1
Advanced processing technology (RANN) (NSF)	—	—	—	—	—	—	—	2.0	
Water	64.9	69.6	73.6	79.9	73.1	61.8	63.6	65.5	67
Watershed management research (FS) (USDA)	3.9	4.3	4.6	6.3	6.6	6.7	8.7	7.5	7
Coastal engineering R&D studies (Civil Functions) (DOD)	9.3	9.5	8.6	10.6	3.3	3.4	3.4	3.5	3
Materials research (Civil Functions) (DOD)					1.7	1.9	1.9	1.7	1
Flood control and navigation (Civil Functions) (DOD)					1.8	3.1	2.5	2.8	3
Water resources planning studies (Civil Functions) (DOD)					1.3	.8	1.5	1.6	1
Bureau of Reclamation (Interior)	7.2	7.3	9.2	10.2	9.7	7.4	7.8	8.6	8
Water resources investigations (GS) (Interior)	11.4	13.3	14.4	14.5	15.0	16.1	18.3	18.9	20
Saline water R&D (OWRT) (Interior)	22.0	24.1	2.40	24.6	20.1	9.5	19.5	20.9	22
Water resources research (OWRT) (Interior)	10.7	10.8	12.4	13.4	13.3	12.8			
Soil-water relationship (TVA)	.2	.2	.2	.2	.1	—	—	—	—
Water control investigations (TVA)	.1	.2	.1	.1	—	—	—	—	—
Land	24.3	27.3	31.8	40.8	47.4	47.1	59.3	61.8	66
Cooperative forestry research (CRS) (USDA)	3.4	3.9	4.7	5.0	4.9	6.2	7.1	7.5	7
Timber management research (FS) (USDA)	9.0	9.8	10.6	12.8	13.0	14.3	16.0	15.7	16
Forest insect and disease research (FS) (USDA)	6.2	7.2	7.4	9.2	9.5	10.7	17.3	18.6	19
Forest resource evaluation (FS) (USDA)	2.3	2.5	3.2	3.4	3.5	3.7	4.1	5.5	7
Special foreign currency program (FS) (USDA)	.4	.6	.5	—	—	—	—	—	—
Surface environment and mining (FS) (USDA)	—	—	—	—	—	1.8	2.2	2.5	2.6
Bureau of Land Management (Interior)	.7	.7	.8	.8	.7	.7	.8	.8	1.0
Alaska-pipeline-related investigation (GS) (Interior)	.6	.7	1.3	1.4	1.2	.9	.3	.3	.3

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	19
Land information and analysis (GS) (Interior)	$.9	$1.1	$2.5	$7.4	$13.8	$7.3	$9.6	$9.8	$10
Forest and wildland resource R&D (TVA)	.7	.7	.8	.8	.3	—	—	—	
Improvement and establishment of wildland vegetation (TVA)	—	—	—	—	.3	.3	.4	.3	
Biomass utilization (RANN) (NSF)	—	—	—	—	—	1.3	1.5	.8	
Recreation	25.5	24.0	28.5	28.3	30.3	33.0	35.6	38.4	3
Wildlife, range, and fish habitat research (FS) (USDA)	2.7	2.7	2.8	3.6	3.5	4.6	4.9	5.6	
Forest recreation research (FS) (USDA)	.8	.9	.9	1.1	1.2	1.5	1.5	1.5	
Bureau of Outdoor Recreation (Interior)	.2	.1	.2	(a)	(a)	(a)	(a)	(a)	
National Park Service (Interior)	2.6	—	1.1	1.3	1.5	2.5	8.4	9.3	
Habitat preservation (FWS) (Interior)	11.4	12.0	14.3	12.5	2.8	3.1	3.9	4.3	
Wildlife resources (FWS) (Interior)					6.2	8.5	9.8	10.2	1
Fishery resources (FWS) (Interior)					5.7	5.7	6.8	7.2	
Federal aid in fish restoration and management (FWS) (Interior)	2.9	3.1	3.5	3.8	3.6	3.0	.2	.1	
Federal aid in wildlife restoration (FWS) (Interior)	4.6	4.9	5.3	5.5	5.4	4.0	.1	.1	
Fisheries and waterfowl resources (TVA)	.3	.3	.4	.3	.2	.2	.2	.1	
Multiresource	44.3	69.6	138.1	150.4	130.0	122.9	133.7	152.7	17
Research on use and improvement of soil, water, and air (ARS) (USDA)	20.4	21.6	25.9	28.8	30.9	32.2	25.7	30.5	3
Sea Grant program (NOAA) (Commerce)	4.0	5.7	11.5	18.4	20.8	15.1	15.5	17.6	1
Topographic survey and mapping (GS) (Interior)	.9	1.0	1.1	1.1	.9	1.3	1.6	1.6	
Special foreign currency program (OS) (Interior)	—	—	—	.5	.5	.5	.1	1.8	
Living resources (IDOE) (NSF)	—	—	.3	.9	2.1	2.6	2.0	2.3	
General support (IDOE) (NSF)	—	—	—	—	—	—	.4	.5	
Resource systems (RANN) (NSF)	—	—	—	—	—	—	.2	3.1	
Resource conservation (RANN) (NSF)	—	—	—	—	—	—	—	.2	
Earth resources detection and monitoring (NASA)	19.1	41.3	99.2	100.8	74.8	71.1	84.5	86.6	9
Applications explorer missions (NASA)	—	—	—	—	—	—	3.7	8.4	1
Food, fiber, and other agricultural products, total	225.0	240.6	246.9	290.7	296.9	291.0	348.5	402.2	42
Production	171.5	180.3	190.1	233.3	241.5	234.0	276.5	320.8	34
Research on animal production (ARS) (USDA)	74.5	80.9	93.5	102.4	33.1	34.7	41.2	49.2	5
Research on plant production (ARS) (USDA)					67.2	68.8	77.3	91.7	9
Food and nutrition research (ARS) (USDA)					6.4	6.5	7.6	10.8	1
Special foreign currency program (ARS) (USDA)	5.7	4.9	4.8	8.6	8.6	7.3	6.6	8.3	
Agricultural research under the Hatch Act (CSRS) (USDA)	51.5	55.5	61.7	65.2	69.1	70.2	77.3	85.7	9
Agricultural research under the Morrill Act (CSRS) (USDA)	3.3	1.6	1.4	12.4	15.4	11.5	15.2	19.5	1
Ocean fisheries and living marine resources (NOAA) (Commerce)	31.9	32.7	23.6	39.5	36.1	29.0	43.5	47.5	5
Innovative biosynthesis techniques (RANN) (NSF)	—	—	—	—	—	—	1.0	.5	
Nonconventional protein (RANN) (NSF)	—	—	—	—	—	.4	.3	.5	
Agricultural projects (TVA)	.2	.2	.3	.3	.3	.2	.2	.3	
Fertilizer development (TVA)	4.3	4.5	4.8	4.9	5.3	5.5	6.2	6.8	
Marketing and distribution	52.5	59.4	55.8	56.4	54.4	56.2	70.8	79.4	7
Marketing efficiency (ARS) (USDA)	38.5	43.6	39.2	39.3	34.0	34.5	46.1	50.9	4
Expansion of agricultural exports (ARS) (USDA)					1.8	1.8	1.8	2.0	
Consumer services (ARS) (USDA)					.4	.4	.4	.6	
Economic Research Service (USDA)	13.2	14.9	15.5	16.0	16.9	18.1	21.3	24.7	2
Farmer Cooperative Service (USDA)	.8	.9	1.0	1.1	1.2	1.4	1.2	1.3	
Other	1.0	.9	1.1	1.0	1.0	.8	1.2	2.0	
National Agricultural Library (USDA)	.4	.2	.4	.2	.3	.1	(a)	(a)	
Statistical Reporting Service (USDA)	.6	.7	.7	.7	.7	.6	1.2	2.0	

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Education, total	$154.8	$146.6	$186.1	$190.7	$214.2	$173.5	$161.2	$188.2	$217.1
Health resources development (HRA) (HEW)	11.9	10.1	16.3	17.8	4.0	3.6	3.8	.5	
National Institute of Education (HEW)	84.1	78.4	75.6	64.2	118.5	75.7	69.9	70.0	90.1
Office of the Assistant Secretary for Education (HEW)	—	—	—	—	—	—	12.6	13.1	13.1
Vocational education: Curriculum development (OE) (HEW)	—	.9	4.0	4.0	4.0	5.9	1.0	1.0	—
Vocational education: Research and innovation (OE) (HEW)	—	—	13.8	16.4	21.1	16.5	15.9	17.1	—
Vocational research: Grants to States (OE) (HEW)	—	—	35.7	18.2	18.0	17.9	18.0	18.0	53.5
Vocational research: Special Projects (OE) (HEW)	—	—	—	[17]18.0	—	—	—	—	—
Special projects: Innovative and experimental programs (OE) (HEW)	—	—	—	—	—	—	—	26.6	23.6
Education for the handicapped (OE) (HEW)	15.5	15.3	14.2	14.3	13.7	9.9	9.6	14.7	11.6
Other education programs (OE) (HEW)	2.5	1.9	.8	1.2	1.6	1.4	1.3	1.2	.2
Head Start (OHD) (HEW)	4.4	4.5	7.5	4.7	14.2	6.7	6.3	6.3	6.3
Institutional Grants for Research Management Improvement (NSF)	—	—	—	—	.3	.2	—	—	—
Institutional Science Development (NSF)	24.3	16.6	5.3	5.3	—	—	—	—	—
Institutional Grants for Science (NSF)	—	8.0	4.3	7.1	3.7	2.7	—	—	—
Science Education Development and Research (NSF)	12.1	11.0	8.8	19.5	15.3	33.0	22.8	19.8	18.2
Income security and social services, total	96.7	106.4	132.1	129.2	162.3	136.7	150.7	154.2	151.7
Native American programs (OHD) (HEW)	—	—	—	—	—	—	—	2.5	2.5
Child abuse (OHD) (HEW)	—	—	—	—	—	—	11.5	11.5	11.6
Child development research and demonstration (OHD) (HEW)	3.6	4.8	12.3	17.3	16.7	16.0	15.0	15.4	11.3
Programs for the aging (OHD) (HEW)	4.2	3.3	2.8	9.0	11.5	7.4	7.2	7.3	7.4
Rehabilitation services and facilities (OHD) (HEW)	28.1	27.4	22.7	28.9	21.8	21.1	21.0	20.9	19.0
Special foreign currency program (OHD) (HEW)	—	—	—	—	—	1.8	2.5	5.3	2.9
Youth development (OHD) (HEW)	—	—	—	—	—	—	.8	1.0	1.1
Income maintenance (OS) (HEW)	NA	NA	NA	NA	11.0	13.5	12.1	10.4	11.2
Health insurance research (OS) (HEW)	[18]15.8	[18]26.5	[18]41.9	[18]21.7	[18]40.2	6.8	5.2	4.7	5.6
Other human services research (OS) (HEW)						5.4	4.9	4.4	6.0
Basic research and statistical data (OS) (HEW)						4.2	4.1	5.5	7.8
Public assistance research and evaluation (SRS) (HEW)	12.5	4.2	8.6	5.8	9.2	8.9	9.6	9.2	9.2
Social Security Administration (HEW)	7.3	12.4	10.9	13.6	18.5	19.4	22.6	25.9	27.0
Employment Standards Administration (Labor)	1.9	2.1	1.5	1.6	1.3	.9	3.2	5.4	5.5
Employment and Training Administration (Labor)	21.0	20.5	21.7	19.6	17.9	16.1	15.5	15.8	15.8
Civil Service Commission	.2	.4	.6	1.0	2.4	3.1	4.4	4.7	3.9
Legal services (CSA)	2.1	4.0	4.9	6.6	6.7	5.0	[19]	[19]	[19]
Research, development, and evalutaion (CSA)	—	—	—	—	—	4.4	8.9	—	—
Distribution and equity (RANN) (NSF)	—	.8	4.3	4.0	5.1	2.9	2.2	4.1	4.1
Area and community development, housing, and public services, total	49.4	91.1	107.9	101.5	117.9	119.9	126.6	136.8	136.3
Housing research (ARS) (USDA)	.2	.2	.3	.2	.2	.2	.2	.3	.3
Rural development pilot research (CSRS) (USDA)	—	—	—	—	—	1.5	1.5	1.5	—
Economic Development Administration (Commerce)	5.3	8.8	4.6	6.6	6.3	4.1	10.3	15.0	6.4
Office of Minority Business Enterprise (Commerce)	—	—	—	.5	2.1	1.0	4.6	1.9	1.9
Department of Housing and Urban Development	21.0	42.7	59.6	58.2	61.7	64.8	62.0	68.1	77.7
Housing assistance research	[20]	[20]	[20]	[20]	13.3	17.0	15.6	15.6	15.8
Housing safety and standards	[20]	[20]	[20]	[20]	.8	3.0	4.1	4.8	6.1
Housing management and maintenance research	[20]	[20]	[20]	[20]	19.6	14.0	4.1	3.4	4.9
State and local government research	[20]	[20]	[20]	[20]	5.7	8.5	8.2	5.4	8.6

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Energy conservation and other housing research	[20]	[20]	[20]	[20]			$4.0	$6.4	$7.7
Neighborhood preservation	[20]	[20]	[20]	[20]	$7.1	$10.5	4.0	4.6	6.5
Utility systems and other community development research	[20]	[20]	[20]	[20]			6.1	7.9	6.9
Other research activity	[20]	[20]	[20]	[20]	11.5	7.7	10.6	13.8	14.6
Administrative expenses	[20]	[20]	[20]	[20]	3.6	4.0	5.4	6.3	6.7
Advisory Commission on Intergovernmental Relations	$.4	$.6	$.5	$.7	.9	1.1	1.2	1.3	1.4
Appalachian Regional Commission	—	—	3.0	—	—	—	—	—	—
Community development (CSA)	22.0	36.2	37.1	26.8	36.6	35.8	39.1	39.0	39.0
Federal Home Loan Bank Board	.3	.4	.4	.5	.5	.7	.7	.8	.8
Service delivery technology and systems (RANN) (NSF)	—	—	—	—	2.0	2.3	2.4	2.0	2.0
Service productivity, and intergovernmental relations (RANN) (NSF)	—	1.8	1.6	6.9	2.8	4.2	2.6	3.1	3.1
Intergovernmental science program (RANN) (NSF)	.2	.5	.8	1.1	4.6	4.3	2.0	3.8	3.6
Economic growth and productivity, total	55.8	79.2	92.5	57.7	68.2	67.5	63.3	78.7	81.5
Forest products utilization research (FS) (USDA)	7.0	7.6	8.3	9.0	8.9	9.3	9.9	11.0	11.4
Forest engineering research (FS) (USDA)	.8	.9	.9	1.4	1.5	1.7	1.6	1.5	1.6
Forest economics and marketing research (FS) (USDA)	2.7	2.9	3.2	3.3	3.6	3.7	3.9	3.9	4.0
Services to improve use of materials (NBS) (Commerce)	5.3	5.7	9.9	10.4	12.8	12.3	14.1	16.6	17.0
Services to improve the application of technology (NBS) (Commerce)	4.4	4.9	6.2	6.7	5.8	7.4	7.1	8.4	8.3
Improvement of computer technology applications (NBS) (Commerce)	.9	1.0	1.9	2.1	2.4	2.4	3.1	3.3	3.4
Bureau of the Census (Commerce)	5.4	6.5	4.1	3.9	1.0	1.0	1.0	1.2	1.3
U.S. Travel Service (Commerce)	—	—	—	—	.8	—	—	—	—
Bureau of Labor Statistics (Labor)	3.8	3.8	3.8	4.8	1.0	1.7	1.8	1.4	1.7
Labor Management Services Administration (Labor)	.1	.3	.5	.7	.9	1.2	.8	2.8	2.6
Office of the Secretary (Labor)	—	—	.2	.2	1.2	2.5	2.0	2.4	2.2
Bureau of Engraving and Printing (Treasury)	.6	.6	.8	1.3	1.0	1.1	1.7	1.8	1.6
Federal Trade Commission	.5	.4	.4	.6	.7	.9	.9	1.2	1.3
General Services Administration	.3	.3	.2	.3	.5	1.8	1.8	1.2	2.0
Technology utilization (NASA)	4.4	5.6	5.6	6.4	5.2	5.2	6.4	8.8	9.2
Advanced industrial processing (RANN) (NSF)	—	—	4.0	4.2	6.4	4.0	3.4	4.0	3.8
Regulation (RANN) (NSF)	—	—	—	—	—	.9	.9	4.0	4.0
Regional productivity research (RANN) (NSF)	—	—	—	—	—	—	—	.8	.9
National productivity measurement (RANN) (NSF)	—	—	2.8	2.5	6.1	2.6	1.2	1.5	1.5
Public private relations (RANN) (NSF)	—	—	—	—	—	—	.6	1.4	1.4
Industrial program (RANN) (NSF)	—	—	—	—	8.5	7.7	1.0	1.1	1.0
Postal Service	19.4	38.7	39.7	—	—	—	—	—	—
Small Business Administration	.2	.1	—	—	—	—	.2	.6	.6
Crime prevention and control, total	4.8	8.6	10.3	25.0	34.8	36.3	45.9	63.2	43.9
Prevention and control of drug trafficking	.6	.8	2.2	4.0	7.3	12.9	13.5	9.6	5.2
R&D on eradication of narcotic-producing plants (ARS) (USDA)	—	—	—	1.6	1.6	1.6	1.6	1.4	1.4
Drug Enforcement Administration (Justice)	.6	.8	1.5	1.2	1.6	5.0	1.5	5.6	4.2
Drug control (LEAA) (Justice)	—	—	.7	1.2	4.2	6.3	10.4	[21]2.6	([21]
Other crime prevention and control	4.2	7.8	8.1	21.0	27.5	23.4	32.4	53.6	38.3
Bureau of Prisons (Justice)	.2	.2	.4	.5	.5	.5	.6	.9	1.9
Federal Bureau of Investigation (Justice)	.3	.2	1.0	.7	.7	1.9	1.2	1.2	1.4
Law Enforcement Assistance Administration excluding narcotics control (Justice)	3.7	7.4	6.8	19.8	26.2	21.0	30.5	51.1	34.5
Courts: Court facilities, personnel and treatment	[13]	[13]	[13]	2.0	2.3	1.1	3.1	1.9	1.9
Crime prevention: Laboratory techniques	[13]	[13]	[13]	1.2	5.3	2.3	1.7	2.8	2.6
Police: Crime detection and prevention methodology	[13]	[13]	[13]	3.5	3.0	.8	2.0	2.0	2.0

Federal R&D obligations by function, subfunction, and agency program: fiscal years 1969-77—Con.

[Dollars in millions]

Function, subfunction, and agency program	Actual							Estimates	
	1969	1970	1971	1972	1973	1974	1975	1976	19
Equipment systems improvement	(13)	(13)	(13)	$9.6	$6.3	$8.1	$.9	$16.5	$
Corrections	(13)	(13)	(13)	3.5	4.1	1.6	3.2	1.4	
Juvenile delinquency							2.8	10.4	
Cooperative research	—	—	—	—	5.3	4.5	3.7	4.3	
Technology transfer	—	—	—	—	—	1.2	6.6	4.7	
Evaluation	—	—	—	—	—	1.3	6.6	7.0	
Immigration and Naturalization Service (Justice)	—	—	—	—	—	—	.1	.3	
International cooperation and development, total	$26.8	$32.2	$32.3	29.5	32.9	26.7	29.8	34.4	3
Departmental funds (State)	.1	.1	.4	.6	1.5	1.5	1.2	1.5	
Agency for International Development (State)	19.5	27.3	29.7	26.0	24.7	21.1	26.7	30.0	3
Action	.8	.1	.1	—	—	.2	.2	.4	
Arms Control and Disarmament Agency	6.0	4.2	1.7	1.9	2.0	1.1	1.0	1.6	
International cooperative scientific activities (NSF)	.5	.4	.5	1.0	4.7	2.9	.7	.8	

[1] Includes lasar fusion prior to 1974.
[2] In the previous function analysis this program was shown under environmental health within the environment function.
[3] National Eye Institute included in National Institute of Neurological Diseases and Stroke.
[4] National Institute on Aging included in National Institute of Child Health and Human Development.
[5] The health and nutrition program of OEO was transferred in fiscal year 1974 to HEW, and the R&D activities under this program were thereafter discontinued.
[6] Laser fusion R&D was included in weapons R&D and testing activities prior to 1974.
[7] The applied energy technology program was redistributed among various other ERDA programs under the new agency structure.
[8] Less than $50,000.
[9] Contribution to the Electric Power Research Institute for research related to the electric utility industry in general.
[10] Includes foreign funds.
[11] Radiological products research includes small amounts for general product safety research.
[12] Environmental health portion of the EPA program cannot be separately identified prior to 1972 and is included under pollution control and environmental protection for the years 1969-71.
[13] Detail not available prior to 1972.
[14] Transferred to NSF environmental biology project support.
[15] Excludes pollution control and environmental protection programs.
[16] Excludes pollution control and environmental protection and energy conservation programs.
[17] One-time funding for career education models.
[18] A group of poverty programs of OEO was transferred to OS (HEW) in 1974 and continued under the activities shown.
[19] Transferred to the Legal Services Corporation, which was authorized in fiscal year 1975 as a public corporation but not as a Federal agency.
[20] Detail not available prior to 1973.
[21] The drug control program is scheduled for funding under block grants to States with no known R&D component.

SOURCE: National Science Foundation

U.S. GOVERNMENT PRINTING OFFICE 1976—241 314 2

Other Science Resources Publications

REPORTS	NSF No.	Price
Characteristics of the National Sample of Scientists and Engineers, 1974. Part 2. Employment	76-323	In press
Detailed Statistical Tables. Manpower Resources for Scientific Activities at Universities and Colleges, January 1976	76-321	—
Detailed Statistical Tables. Graduate Science Education: Student Support and Postdoctorals, Fall 1975	76-318	—
Detailed Statistical Tables. Expenditures for Scientific Activities at Universities and Colleges, Fiscal Year 1975	76-315	—
1985 R&D Funding Projections	76-314	$0.75
Reviews of Data on Science Resources, No. 27, "Education and Work Activities of Federal Scientific and Technical Personnel, January 1974"	76-308	$0.40
Reviews of Data on Science Resources, No. 26, "Energy and Energy-Related R&D Activities of Federal Installations and Federally Funded Research and Development Centers. Funds, FY 1973-75 (est.) and Manpower, Jan. 1973-75 (est.)	76-304	$0.35
Reviews of Data on Science Resources, No. 25, "Doctoral Scientists and Engineers in Private Industry, 1973"	76-302	$0.35
Projections of Degrees and Enrollment in Science and Engineering Fields to 1985	76-301	$1.15
Characteristics of the National Sample of Scientists and Engineers, 1974. Part 1. Demographic and Educational	75-333	$1.90
Detailed Statistical Tables. Engineers, By Field. The 1972 Scientist and Engineer Population Redefined. Volume 2. Labor Force and Employment Characteristics	76-306	—
The 1972 Scientist and Engineer Population Redefined. Volume 2. Labor Force and Employment Characteristics	75-327	$2.65
The 1972 Scientist and Engineer Population Redefined. Volume 1. Demographic, Educational, and Professional Characteristics	75-313	$3.70
Reviews of Data on Science Resources, No. 23, "R&D Expenditures of State Public Institutions, Fiscal Year 1973"	75-311	$0.35
Reviews of Data on Science Resources, No. 24, "Work Activities of Employed Doctoral Scientists and Engineers in the U.S. Labor Force, July 1973"	75-310	$0.65
R&D Activities of Independent Nonprofit Institutions, 1973	75-308	$1.90
Research and Development in State Government Agencies, Fiscal Years 1972 and 1973	75-303	$1.80
Young and Senior Science and Engineering Faculty, 1974: Support, Research Participation, and Tenure	75-302	$1.70
Projections of Science and Engineering Doctorate Supply and Utilization, 1980 and 1985	75-301	$1.30

HIGHLIGHTS		
"Energy Increase of 20 Percent Leads Industrial R&D Spending in 1975"	76-324	—
"Federal Agencies Allocated Over $4.5 Billion to Universities and Colleges in FY 1975"	76-327	—
"Self-Supported Graduate Science Students Increased by 22 Percent in 1975"	76-320	—
"The Nation's Science and Engineering Manpower Resources: 1974"	76-312	—
"Academic R&D Spending Up 12 Percent in FY 1975"	76-307	—
"Racial Minorities in the Scientist and Engineer Population"	75-314	—